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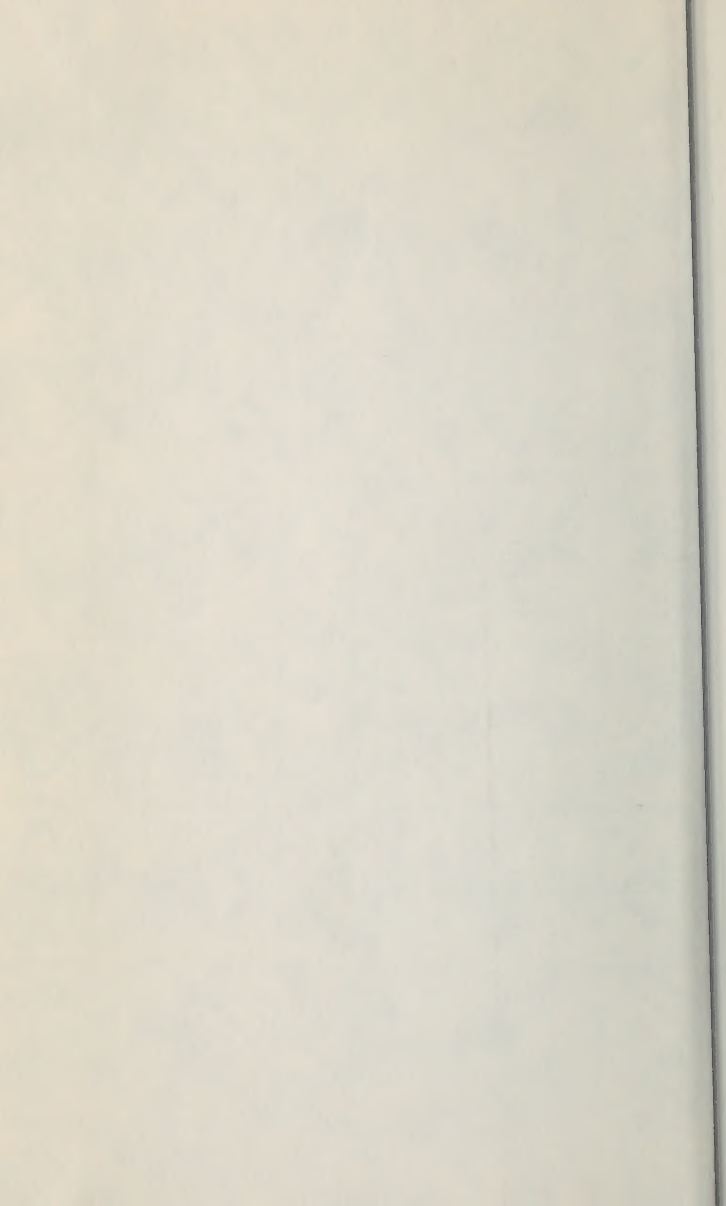
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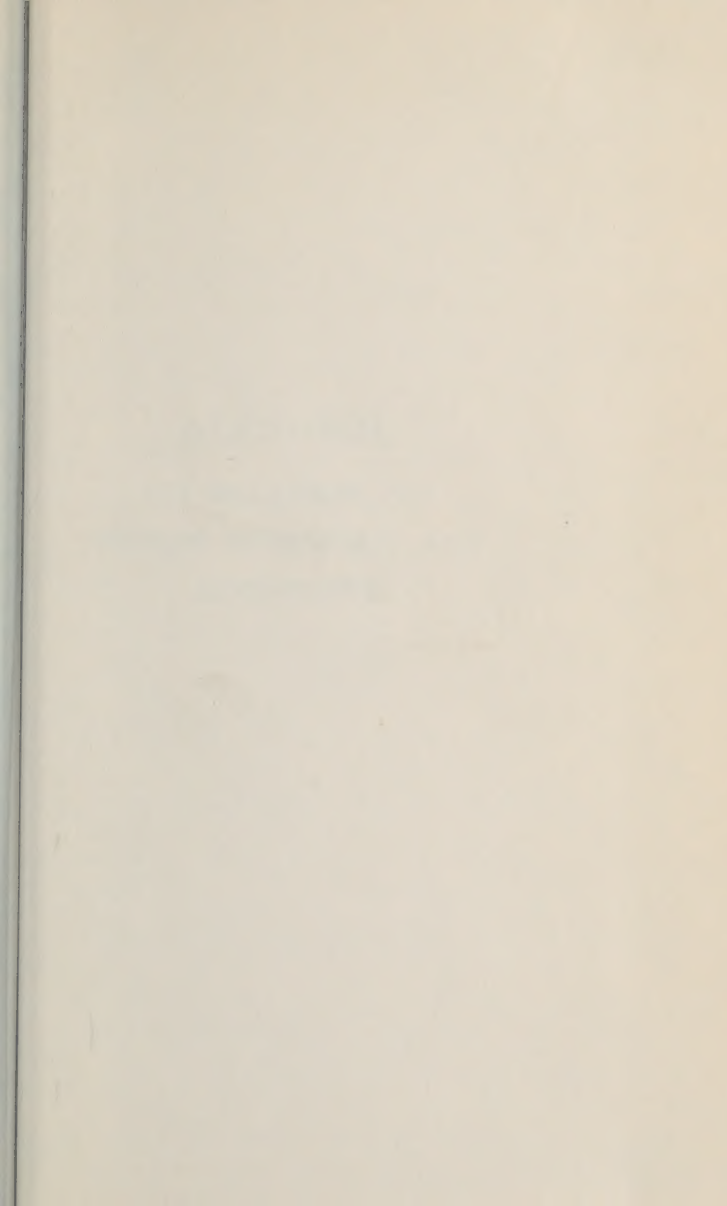


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ALCOHOL
ITS RELATION TO
HUMAN EFFICIENCY AND
LONGEVITY



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To maintain a central clearing house of information regarding personal hygiene and how to live.

To insure scientific accuracy and up-to-dateness in its work by enlisting the cooperation of a board of 100 men eminent in medical science and educational work.

To arrange periodic physical examinations in any part of the United States and Canada for groups (insurance policyholders, employees, etc.) and for individual subscribers so that knowledge of personal hygiene and how to live may be applied with accuracy according to special needs.

To maintain an educational service, conveying to its members the latest information on such subjects after due consideration by the Hygiene Reference Board.

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LIFE EXTENSION INSTITUTE, INC.
25 WEST 45th STREET :: NEW YORK CITY

ALCOHOL

ITS RELATION TO HUMAN EFFICIENCY AND LONGEVITY

BY
EUGENE LYMAN FISK

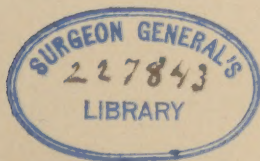
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25 WEST 45TH STREET, NEW YORK CITY

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FOREWORD

IT is a curious fact that, in spite of the enormous increase of interest in the alcohol problem, there has been, prior to the publication of the present book, no condensed and non-technical statement of the most recent conclusions on this problem available for the ordinary reader in this country.

Many things are now known concerning the effects—physiological, psychological and social—of alcohol which were not known a few years ago; and there is, consequently, a growing desire, on the part of men of affairs, to learn the exact facts and to make use of this knowledge in their business. Indeed, it may be said that the chief driving force today toward temperance and total ab-

stinence, whether voluntary or enforced, is an economic force—the constant urge toward industrial efficiency. It is this new force which, added to forces previously at work, has in recent years caused the tidal wave of prohibition to sweep over this country.

The Great War has suddenly added another and mightier force in the same direction; for military efficiency is even more insistent in its demands than industrial efficiency.

Whether or not the war will bring about world prohibition, either temporary or permanent, it will certainly stimulate millions of people to study the alcohol problem.

In order to study it without being misled either by the biased statements of those who have a financial interest in continuing in the manufacture or sale of alcoholic beverages, or by the un-

proved and often greatly exaggerated claims of unscientific reformers, it is necessary to have at hand, for the guidance of the public, a judicial pronouncement on the evidence in the case. We hear too much from *exparte* counsel and too little from those who are entitled to seats on the bench of scientific judges.

I know of no one better fitted than Dr. Fisk to hold the balance true, or who is better informed on the evidence available and on its reliability. I therefore commend his book to the public as, so far as I know, the best, the sanest, and the most up-to-date, in the English language.

IRVING FISHER.

Yale University, May, 1917.

PREFACE

IN this book a number of articles recently contributed to the *Atlantic Monthly* have been collected and submitted to the Hygiene Reference Board of the Life Extension Institute for approval. Much of the material and evidence used in the articles has already been considered by the Board and approved in the various publications of the Institute. Some additional material relating to matters of fact and record has been included in the Supplementary Notes. The Board was practically unanimous in endorsing the author's presentation of the evidence, only a few members dissenting. Their dissent was for various reasons, some not having time to thoroughly digest the evidence and

others taking an extremely conservative stand on any discussion relating to alcohol on the ground that practically all such evidence is open to question in the present state of knowledge.

It is a curious fact that while scientific men and especially medical men have still been debating whether or not moderate drinking carried any menace to health, there has been a surprising unanimity among laymen entrusted with the responsibility of governing human labor and directing activity the success of which depends on efficient functioning of the human mind and body. Factory managers and military men, statesmen concerned with the efficiency of the individual and the productivity of his labor and the quality of the results, have decided against alcohol on general principles, derived from practical observation of its results in the laboratory of

the workaday world. I am aware that general observation is not always a trustworthy scientific guide, and that closely tested and controlled observations must be assembled and analyzed with fanatical punctiliousness before science can be satisfied on such a question, but it so happens that there is available a certain body of evidence of a character that gives ample warrant for the vigorous measures taken against alcohol by business and government.

The author has endeavored to investigate the evidence, and interpret it, regardless of public prejudice either for or against it, just as he would investigate mouth infection, flat foot, or the food value of cereals. He recognizes no reason why alcohol should not be investigated in this way, just as one would investigate digitalis or strophanthus, or chlorinated lime, always bearing in mind

that psychic effects must be taken into consideration and given due weight, as well as purely physical effects. Such excuse as there might logically be for using alcohol as a beverage, based upon its peculiar social influence, is referred to in very plain language in the text, and the reader must take the evidence as to possible life injury from alcohol and estimate whether any apparent gain in surcease from life's complexities is worth the cost; that is, if society does not in the near future settle the matter very definitely for the individual by making it as difficult for him to secure a drink of liquor as to secure a dose of morphine.

EUGENE LYMAN FISK.

Life Extension Institute, New York,
May, 1917.

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PART ONE

ALCOHOL
AND LIFE INSURANCE

I

ALCOHOL AND SOCIETY

APPROXIMATELY two thousand million gallons of alcoholic beverages are consumed each year in the United States. This whole vast aggregate is created from materials such as starch and sugar, which are necessary for the sustenance of mankind. Prodigious quantities of good food, soundly adapted to the human machine, are expensively treated and destroyed to make alcohol. Surely there is matter here for consideration in connection with the high cost of living.

But the alcohol question far transcends consideration of expense. In considering its importance to humanity, our inquiry naturally separates into three lines of investigation. First, there is its food

value, because for ages alcohol has been used on the table. Rightly or wrongly, it has found its way into the good society of nourishment and hospitality. Second, its social value, its peculiar effect on brain and nervous system, entirely apart from its energy-providing or tissue-sparing qualities. Third, the demands it makes on the pocket and body, on mind and life.

These questions are of enormous social and economic importance. If real happiness, even though fleeting, if real energy, though only for the creative moment, can be secured for the price of a drink, let us all drink! Let us teach our wives and children to utilize these blessings of alcohol, if such there be, while also teaching its dangers. If the steady use of alcohol is beneficial to normal people, let us convert the total abstainer from his evil ways of neglect,

and teach him the great benefit of indulgence. Let us warm him up and civilize him; let us show him what he is missing in life. But bear in mind that the question is put in a rigidly literal sense: Can real happiness and energy be secured *for the money price of a drink?*

This is a matter to be settled by logic applied to evidence. Unfortunately, as Spencer has said, the judgments of most men, even on the more important affairs of life, are determined rather by feeling than by evidence. This is peculiarly true as to the alcohol question.

FEELING VERSUS LOGIC

As Dr. Haven Emerson recently expressed it, it is difficult for the physician who has seen the ravages of alcohol among hospital and dispensary patients to be impersonal and impartial in dis-

cussing it. Its ill effects are so frightful, the misery it unquestionably causes is so widespread, that the impulse is to banish it forthwith from the earth rather than to take any further chances with its effects on humanity.

On the other side, however, we have the testimony, not to be lightly treated, of those who have used it temperately and value it; whose ancestors have used it temperately and valued it; who regard it as one of the solaces of mankind in a world that is all too full of weariness and sorrow and fatigue; who look upon it in part as a food, in part as a useful sedative to overactive or strained faculties which are battling with an existence daily growing more complex: such people would agree with John Fiske, that alcohol "diminishes the friction of living" and "bridges over the pitfalls which the complicated exigencies

of modern life are constantly digging for us."

Regulation and moderation, rather than total abstinence, appeal to such thoughtful people as a reasonable compromise with alcohol. There are others—a very large percentage—who do not think at all, but just drink, and drink, and drink.

Those who are seeking to come to some conclusions as to the ultimate functions of alcohol and the desirability of its restriction to inanimate machines whose insides it cannot injure, would do well first to measure its total effects on humanity. Why go through the throes and agonies of debate and propaganda until we have settled the question as to whether or not the so-called moderate drinker needs to be disturbed in his indulgence, either by education or by legislation?

SOURCES OF EVIDENCE

In a strictly scientific sense, of course, no drinking is moderate that causes any injury to the body, however slight, or that in any way impairs the efficiency of the mind or body. If alcohol in the smallest doses usually taken produces injurious effects and in any way lessens the efficiency of the body, then there is no such thing as moderate drinking. The question, Does moderate drinking shorten life? is a contradiction in terms. The logical form of the question is, Does alcohol in the smallest quantities customarily used as a beverage shorten life, impair the efficiency of the human body, or in any way adversely affect the mind, character, or career of the user?

What then are the sources of evidence?

Common observation of the obvious effects of fairly free indulgence in alco-

hol is not without its value. Every sensible person recognizes that there is a danger-line in the use of alcohol long before visible intoxication is reached, and that life and character and action may be unfavorably affected by steady drinking. The most comprehensive and exact source of information, however, should be the death-rate among large masses of human beings who have used alcohol, as compared with other large masses, alike as to age and general condition, who have not used it. Fortunately, there is a large body of important evidence on the subject, which has lately been much increased in volume and in accuracy by the investigations of American life-insurance companies.

In addition to the experience on large groups of lives as regards mortality, and the incidence of special forms of disease, we require the testimony of the labora-

tory as to the effect of alcohol on individuals—the measured effect of small doses, or at least doses approximating the smallest amount that would be used as a beverage. What action lesser amounts may have is a purely academic question, not confronting us in the workaday world. We also need the testimony of the clinic and of the sick-room as to the apparent effects of alcohol in therapeutic doses, its apparent influence on the course of disease. This latter evidence is less exact, yet not without its value when combined with evidence from other sources.

WHAT LIFE INSURANCE REVEALS

Now, the purely statistical evidence derived from life-insurance experience must be interpreted in the light of the evidence from varied sources on the ef-

fects of alcohol on the human organism. To accept the life-insurance figures at their face value would be unscientific and unsafe. Furthermore, the life-insurance statistics must also be considered in the light of evidence as to how they were accumulated, the various factors entering into the selection of insured lives that might influence the mortality in the classes considered.

¹ The first important compilation of life-insurance experience showing the comparative mortality of abstainers and users, was that of the United Kingdom and General Provident Institution of Great Britain. This institution was founded at a time when the total abstainer was looked upon as a "queer duck," probably mentally unbalanced

¹ Charts showing insurance mortality among abstainers and various types of drinkers are reproduced on pages 204-207.

and certainly physically weak. In fact, this particular company was founded by a man who had been asked to pay an extra premium because he insisted on being a total abstainer. Later in the history of the company both classes were accepted, abstainers and users, but in no case those who were other than temperate in the use of liquor.

BRITISH LIFE-INSURANCE EXPERIENCE

The records of this institution show that during the period from 1866 to 1910, the users of alcohol, who were about equal in number to the non-users, and selected as high-grade, temperate "risks," showed a mortality 37 per cent. in excess of that exhibited by the abstainers. These figures are particularly significant because the users of alcohol showed a lower mortality than that of

British insured lives generally. Thus the comparison was made with a high standard of excellence, and yet the abstainers excelled the standard to a marked degree.

It is of interest to know that, while in the course of the company's whole experience the excess mortality among users was 37 per cent., the mortality among users between the ages of 35 and 40 was 83 per cent. in excess, showing the influence of some extremely unfavorable factor at that critical period. Was it alcohol? Let us wait and see.

The best evidence of the reality of the saving among the abstainers is the action of the company in paying bonuses to the abstainers, and the action of other companies in anticipating such bonuses by charging lower premium rates to abstainers. The saving is just as genuine and positive as that effected by a manu-

facturer who is able to reduce the cost of manufacturing hats or automobiles.

Other British and Scottish companies—the Sceptre Life, the Scottish Temperance Life, the Abstainers' and General Life—show similar experiences; not over so long a period or for such a large group, to be sure, but the evidence is all in one direction, the excess mortality among users ranging from 37 per cent. to 51 per cent. These figures, though widely quoted by temperance reformers, have not until recently been accorded their full value by actuarial authorities in this country. Various explanations other than the influence of alcohol were offered, and the fact that they were chiefly British figures deterred many from accepting them as reflecting probable conditions among insured risks in this country.

SWEDISH LIFE-INSURANCE EXPERIENCE

Ekholm, reporting the experience of the Swedish Life Insurance Company, 1897-1906, on about 35,000 lives, of whom somewhat more than half were abstainers, found a general difference of 6 per cent. in favor of abstainers, even in that brief period. Beyond the age of 44 the difference was 26 per cent. in favor of abstainers. Here, too, the trend of the mortality (the difference in favor of the abstainers increasing with increasing age of the policies) suggests that on an experience as extended as that of the British company the abstainers would show an advantage of approximately the same degree.

Ekholm, again quoted by Quensel in the "Year-Book of the United States Brewers' Association," claims that, to settle the question properly, comparison

should not be made of abstainers with users; but that the mortality among those using alcohol in varying degrees should be compared with that among abstainers, so that zero might be compared with slight indulgence, moderate indulgence, free indulgence, and so forth. He states that such statistics are now being collected in Sweden, but that it will take a long time to complete them.

AMERICAN LIFE-INSURANCE EXPERIENCE

Fortunately, we have in this country comprehensive evidence exactly along these lines. In 1908, forty-three American life-insurance companies—the older established, “old-line” companies, few of which had made any important effort to establish a total-abstaining class—undertook to investigate their mortality

experience among various classes of "border-line" risks, such as overweights, underweights, those with histories of various illnesses, and the like, and included in the investigation the mortality among the users of alcohol, classified according to the degree of their indulgence. No investigation was made of total abstainers. There was also computed the relative death-rate from such organic diseases as pneumonia, Bright's disease, and cirrhosis of the liver, among the various classes of drinkers, and among those engaged in the various branches of the liquor trade.

II

MEDICO-ACTUARIAL INVESTIGATION

THIS investigation covered the period between the years 1885 and 1908, and its great value lies in the fact that the material was drawn from the records of 2,000,000 policyholders, and that all individuals were excluded from the study except those of sound average condition when insured. The final groups studied were, therefore, pure, or homogeneous, except for their varying use of alcohol or their varying exposure to alcohol as determined by their occupations. All extraneous influences, such as overweight, underweight, impaired family history, or personal history, were excluded. The results may be subdivided as follows:

First, those who were accepted as standard lives, but whose histories

showed occasional alcoholic excess in the past. The mortality in this group was 50 per cent. in excess of the mortality among insured lives in general, equivalent to a reduction of over four years in the average lifetime of the group.

Second, individuals who took two glasses of beer, or a glass of whisky, or their alcoholic equivalent, each day. In this group the mortality was 18 per cent. in excess of the average.

Third, men who indulged more freely than the preceding group, but who were considered acceptable as standard insurance "risks." In this group the mortality was 86 *per cent.* in excess of the average.

STRIKING COMPARISONS

It should be borne in mind that these comparisons are made with the general

class of insured individuals, both users and non-users of alcohol. Comparison with total abstainers alone would probably show much greater differences. It is noteworthy that in these drinking groups the death-rate from Bright's disease, pneumonia, and suicide was above the normal, and that among the steady so-called moderate drinkers—those using more than two glasses of beer or one glass of whisky daily—the death-rate from cirrhosis of the liver was five times the normal.

The story becomes monotonous in its uniformity: wherever we find alcohol we find higher mortality, and a mortality consistently increasing with an increasing use of alcohol. But we must follow on the story to the end.

A NON-PARTISAN BUSINESS INVESTIGATION

The collection of these insurance statistics was made under the direction of a committee of actuaries and medical directors selected by the representatives of the important life insurance companies of this country because of their peculiar fitness for the task. This committee, of which Mr. Arthur Hunter was chairman, constituted an extremely conservative as well as highly specialized body of intelligence; indeed, these men were fairly saturated, not only with scientific, but with business conservatism, for their main purpose was to ascertain facts from which principles of business action could be derived. Alcohol was merely one feature among many that were investigated, and the conditions were such that no possible bias could

influence the results. Nevertheless, these figures have been attacked by some and belittled by others, on the grounds that they were loosely assembled and that the varying practices of the contributing companies in accepting risks tended to make the results misleading and interfere with a well-balanced study of the conditions.

To test the general consistency of the figures, Mr. Hunter analyzed the experience of the company of which he is actuary, the New York Life, with the following results:

HIGH MORTALITY AMONG USERS OF ALCOHOL

Those drinking beyond "Anstie's limit" (one and one-half ounces of absolute alcohol daily¹) were classified as steady

¹ Equivalent to about three ounces of whisky or about one quart of beer.—THE AUTHOR.

free users. The mortality in that class was double that among the general body of policyholders accepted at regular rates: that is, the extra risk on these lives was as great as in cases of heart disease, syphilis, and other diseased or impaired states that loom much larger in the mind of the average drinker than does his indulgence. In fact, the insurance company treated these cases accordingly, and placed liens on the policies, or charged "rated up" premiums, to provide against the expected high mortality. This was "cold business"; no bias, no sentiment, but a charge for the risk, just as would be the case in an extra fire or marine risk. The man who passes Anstie's limit goes into a sub-standard class, and a poor sub-standard class at that. While individually he may escape, he belongs to a class that is fated to lose twice as many men in

the same space of time as the general average.

Further figures from the same company show the following:

	<i>Approximate Extra Mortality</i>
Excessive use of alcohol a short time prior to date of application.....	80 per cent.
Excessive use of alcohol not recently, but within five years of date of application.	45 per cent.
Entire class with history of excess, includ- ing above and also those whose last excess occurred more than five years prior to date of application.....	60 per cent. ¹

This confirms the clinical judgment expressed recently by Dr. Bernard Sachs, the neurologist, at a meeting of the New York Academy of Medicine, that alcoholic excess always leaves some permanent injury on the life.

¹ Among these classes the death-rate from apoplexy, Bright's disease, and suicide was high.—THE AUTHOR.

AFTER TAKING "THE CURE"

The figures of the New York Life Insurance Company show that among those who had taken a cure for alcoholism, but were temperate at time of acceptance, the extra mortality was 70 per cent. In the experience of the forty-three companies, among those who had taken a cure, but remained total abstainers up to the time of acceptance, the mortality was 35 per cent. above the normal. Those who had been heavy drinkers, but who had reformed without taking a cure, showed an extra mortality of 32 per cent., doubtless because of stronger will-power and sturdier nervous constitution. These comparisons are made, as has been stated, with the general class of insured lives. In order to measure more closely the effect of so-called moderate drinking, Mr. Hunt-

er has recently brought together a considerable group of experiences in which the relative mortality among abstainers and users in a number of American companies is shown.

The Manufacturers' Life of Canada, the Security Mutual of New York, the Mutual Life of New York, have all published experiences which have now been brought up to recent date, and in addition the results in the Northwestern Mutual, the Phoenix Mutual, the Peoria Life, the Equitable Life of New York, and the New England Mutual are shown. Through Mr. Hunter's kindness I am able to produce these figures.

DRINKERS AND ABSTAINERS COMPARED

The Mutual Life's experience from 1875 to 1889 showed a mortality among abstainers 23 per cent. less than among

users. It was also found that the death-rate among beer-drinkers was almost the same as among wine- and spirit-drinkers. A second investigation by Dr. W. E. Porter, medical director of the company, covering the years 1907 to 1912, showed the mortality among total abstainers to be 17 per cent. less than among temperate, and 26 per cent. less than among moderate, users. These are doubtless minimum figures, as they cover only a few years, and do not give time to reckon with the full adverse effects of alcohol, especially as the cases under investigation had only recently been accepted after careful medical examination.

In the New England Mutual Life, Dr. Dwight reports the mortality among abstainers to be 17 per cent. less than among those rarely using, 29 per cent. less than among temperate, and 53 per

cent. less than among moderate, users. These classes were fixed by the habits at time of acceptance for insurance. The results were almost parallel with cases of tobacco-users, except that the free users of alcohol showed a much higher mortality than free users of tobacco.

The Northwestern Mutual's experience exhibited some curious conditions. Temperate beer- and wine-drinkers showed a mortality only about 3 per cent. in excess of abstainers, while whisky-drinkers and heavy beer-drinkers showed a death-rate 25 per cent. higher than the abstainers. This company had a clause reserving the right to cancel a policy for intemperance, and there was no attempt made to determine whether the abstainers continued their mode of life, as is usually done in companies maintaining a separate abstainers' department. Furthermore, this company ruled

very strictly in accepting users of alcohol, so that the abstainer is compared with an unusually temperate type of insured "risk."

RECORDS OF ABSTAINERS' CLASSES

In 1900, the Equitable Life established an abstainers' class and admitted new entrants until 1906. People were eligible who had been total abstainers for a number of years. The dividends were effective at the end of ten years, and depended on the mortality in the abstainers' class. Judging from cases in which dividends have been paid, the death-rate in the abstaining class has been at least 25 per cent. less than in the general class.

In the Phoenix Mutual Life Insurance Company, of Hartford, the mortality among abstainers accepted between

1851 and 1861, as compared with mortality in the general group of policyholders accepted since 1861, showed an advantage of 15 per cent. among abstainers, notwithstanding the improvement in insurance mortality that has taken place in recent years.

The Security Mutual Life, of Binghamton, New York, established a total-abstainers' class in 1900. Up to the present the mortality for this class is 30 per cent. less than for the general class.

The Manufacturers' Life of Canada has had an abstainers' section for the past twenty-nine years. In 1906-1910, the difference in favor of the abstainers was 40 per cent.; in 1910-1916, 35 per cent. These gains of the abstainers are over a very favorable general mortality, which tends to strengthen the view that the chief reason for the mortality difference is alcohol.

The Peoria Life has had an abstainers' section for the past seven years, and reports a difference in favor of abstainers of 25 per cent.

Another important American company gives me the following figures: abstainers show a death-rate 37 per cent. lower than moderate, but not daily, drinkers; 32 per cent. lower than steady users drinking less than three glasses of beer or two whiskies daily; and 50 per cent. lower than those using more than three glasses of beer or two whiskies daily. All members of these drinking classes were accepted as supposedly temperate standard risks.

OCCUPATIONAL HAZARDS FROM ALCOHOL

Not the least important feature of the investigation conducted by the forty-

three companies was the mortality figures in occupations where alcohol figured as a hazard.

These were as follows:

	<i>Death-rate above the normal</i>
<i>Hotels</i>	
Proprietors, superintendents, and managers not tending bar.....	35 per cent.
Proprietors, superintendents, and managers tending bar	78 per cent.
<i>Saloons and billiard-rooms, pool-rooms and bowling alleys with bar</i>	
Proprietors and managers not tending bar.	82 per cent.
Proprietors and managers tending bar.....	73 per cent.
<i>Breweries</i>	
Proprietors, managers, and superintendents	35 per cent.
Clerks	30 per cent.
Foremen, maltsters, beer-pump repairmen, and journeymen	52 per cent.
<i>Distilleries</i>	
Proprietors, managers, and superintendents (15 per cent. below normal).	
Traveling salesmen and collectors for dis- tilleries, breweries and wholesale liquor houses (excluding lifelong total ab- stainers)	28 per cent.

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*Death-rate above
the normal*

Wholesale Liquor Houses

Proprietors and managers.....	22 per cent.
Clerks	12 per cent.

Restaurants with bar

Proprietors, superintendents, and managers not tending bar.....	52 per cent.
Waiters in hotels, restaurants, and clubs where liquor is served.....	77 per cent.

These figures indicate that saloon-keepers have a death-rate higher than that of underground mine foremen; that brewery foremen, maltsters, and the like, have a death-rate higher than electric linemen, glass-workers, city firemen (laddermen, pipemen, hosemen), metal grinders or hot-iron workers, although there is nothing in the brewery or saloon business *per se* that is at all hazardous or unhealthful, aside from the possible temptation to drink and its collateral hazards. Proprietors of distilleries are obviously not so directly

exposed to temptation or to other adverse influences that obtain in the retail liquor trade; this accounts for the favorable mortality.

Among hotel-keepers tending bar the death-rate from cirrhosis of the liver was six times the normal; from diabetes, three times the normal; from cerebral hemorrhage or apoplexy, nearly twice the normal; from organic diseases of the heart, nearly twice the normal; from Bright's disease, nearly three times the normal; from pneumonia, nearly twice the normal.

For brewery officials insuring under 45, the death-rate from cancer and other malignant tumors, cerebral hemorrhage and apoplexy, organic diseases of the heart, pneumonia, and Bright's disease, among the proprietors, managers, and superintendents is about twice the normal, and from cirrhosis of the liver

three times the normal. The death-rate from suicide is nearly twice the normal.

While there are individual differences in various companies, due to the varying standards of selection and classification, nevertheless the general trend of mortality is the same in all companies and shows that "Old Mortality" and "John Barleycorn" are exceedingly good cronies. Wherever you find alcohol you find the following formula at work: More alcohol = higher death-rate.¹

¹ Mr. Charles F. Emerson, Dean Emeritus of Dartmouth College, has been good enough to furnish me the following figures as to graduates of the College in Classes 1868 to 1878.

Deaths within 25 years of graduation

Non-users of liquor.....	13 per cent.
Users of liquor.....	26 per cent.

Deaths within 35 years of graduation

Non-users of liquor.....	22 per cent.
Users of liquor.....	41 per cent.

This is a small group, and would require close checking as to the homogeneity, except for alcohol, of the drinkers and non-drinkers; but in the light of the larger statistical evidence, it offers interesting confirmation of the fact that high mortality follows the flag of alcohol.

—THE AUTHOR.

III

LIFE INSURANCE FIGURES INTERPRETED

NEVERTHELESS, scientific caution and veracity impose the obligation not to accept the life-insurance figures at their face value, but carefully to analyze and interpret them in the light of available knowledge regarding the physiological effect of alcohol, and also with due regard to the conditions under which these risks were selected. In judging the matter, all preconceived notions and traditions arising from the fact that alcohol has been closely interwoven with our social fabric for centuries should be excluded. Its age-long use is no proof that it is not a noxious and destructive agent, holding back the human race from

higher planes of living. The postulate that time has justified alcohol involves an affirmation that we hold present conditions permanently satisfactory; that crime, immorality and disease have reached an irreducible minimum.

There is, as a matter of fact, no evidence that man is either physically or mentally superior to what he was in the days of "the Greeks, our masters." On the contrary, there is much evidence that man is physically degenerate, notwithstanding the fall in the total death-rate due to the checking of epidemic disease and infant mortality. Both with and without alcohol nations have risen and fallen. The *post hoc ergo propter hoc* principle of reasoning is as unsafe in interpreting the effect of alcohol upon life-insurance mortality as its effect upon the historical progress of nations. In considering these things we must avoid

the fallacious implication in the expression, "survival of the fittest," and remember that many organisms and races survive because they are barely just good enough, not because they have reached perfect adjustment and attained the highest possible development.

SELECTIONS OF RISKS ANALYZED

In reviewing the evidence offered by the life insurance companies, we must scrutinize the conditions under which the "risks" were accepted. Whatever may have been the earlier ideas regarding total abstinence, it is well known that the non-abstaining policyholders in the British company whose experiences have been quoted were very carefully selected; indeed, the greater confidence in the longevity of abstainers manifested by the establishment of special depart-

ments for them no doubt influences the management of such companies to accept slightly impaired abstainers with greater confidence than slightly impaired users; hence there is no reason to believe that the general physical or social type of the abstainers was superior to that of the general class.

In the American companies especially, the custom has been to rule strongly against the alcoholic. One large company with which I was connected for many years had an almost inflexible rule that intoxication within one year of the date of application disqualified a candidate; free drinking, exciting some doubt as to the future, disqualified for a period of at least three years after reform, if not permanently, depending upon the extent of the habit; and treatment for the liquor habit called for rejection. It will be noted that this was

wise practice, according to the mortality figures just produced.

It is extremely important to bear this in mind, for the reason that these standards of selection show that the mortality figures as to drinkers are derived from supposedly favorable types, and that many individuals in the general population admitting the same degree of indulgence would show a higher mortality. That is, a policyholder admitting an indulgence of three glasses of beer daily would show a lighter mortality than the average man in the population indulging to the same degree. The application of a person suspected of being seriously tainted with liquor is never knowingly accepted on standard forms of insurance by any company. The same principle holds good for persons engaged in those special occupations in which liquor is a hazard. The habits of all such candi-

dates are closely scrutinized, and the benefit of any reasonable doubt is given to the company rather than to the applicant.

STANDARDS OF SELECTION

It is commonly stated that, inasmuch as these classifications as to the degree of drinking were based on the applicants' own statements, they cannot be accepted as accurate, and that the excess mortality among the alleged moderate users of alcohol was due to the admission of cases of marked intemperance or to the subsequent development of intemperance among members of that class. Some allowance must of course be made for such a factor, but the broad assumption that the life insurance companies accepted without question the testimony of applicants as to their habits is without warrant.

Even in the British companies, some evidence as to character other than the applicant's own statement is required; and the medical examiner is also required to pass upon the apparent truthfulness of the statements regarding the use of liquor, past and present.

In American companies, there is a very careful investigation made of the habits of life of all applicants. The "moral hazard" is considered quite as carefully as the physical hazard, and a life that is morally impaired or seriously threatened with moral impairment is rejected. In other words, a man who is in danger of life-failure is not considered a good "risk." Liquor is one of the main factors in impairing the moral hazard. A life insurance company looks on this matter from a cold-blooded business standpoint, entirely apart from any standards of social morality. Men

are often rejected because of drink who are still socially respected; and men are accepted for life insurance who are not socially respected, provided their habits are not injurious to health and their future seems reasonably secure. There has for years prevailed among life-insurance offices a distrust of the man who drinks every day, even in so-called moderation; and the applications of such persons are always scrutinized very carefully before acceptance. In the main, therefore, the classification of these persons with respect to their consumption of alcohol may be regarded as sufficiently accurate for the purpose of the inquiry.

IV

CHARACTER OF ABSTAINERS INSURED

THE question of the relative physical condition of abstainers and of the various classes of insured drinkers having been considered, let us inquire as to the relative social character of the two groups. It has often been claimed that abstainers are a mean lot, often too stingy to die or indulge in anything except long life, and that they are drawn largely from occupations characterized by conservative living, such as that of clergyman, schoolteacher, college professor, and the like. In this connection, a summary of the statements of Mr. Roderick McKenzie Moore, Actuary of the United Kingdom Temperance and

General Provident Institution, is entitled to a large measure of confidence. I have the best means of knowing that he is a man governed by scientific caution and veracity, desirous of presenting the facts free from bias, purely as a contribution to science.

TOTAL ABSTAINERS NOT A "PECULIAR" CLASS

He has stated that "the total-abstainer class" was not nursed, or favored to produce a low mortality. So far as could be determined (and many of the risks came in personal contact with the officers) they were of the same general class as the non-abstainers. They were written by the same group of agents, for the same kind of policies, for the same average amounts, *and were in the same general walks of life*, and of the

same general financial condition. They were almost equal in numbers to the general class and did not form a small high-grade section of the policyholding body. On the contrary, greater care was exercised in the selection of the users of alcohol because of the less favorable experience anticipated with them, and many border-line "risks" were accepted in the abstaining class because of a feeling that their abstinence would neutralize some unfavorable factor.

These statements of the expert, who has personal contact with many of the cases in question, are of greater value than the off-hand criticisms of those who have no first-hand knowledge of the group and who have never taken the trouble carefully to read and digest the evidence.

As to American evidence along similar lines, the analysis of the Security

Mutual's abstaining group also shows that total abstainers are drawn from every class in the community.

Clergymen	4 per cent.
Farmers	19 per cent.
Clerks	15 per cent.
Miscellaneous (men earning \$15 to \$25 per week)	62 per cent.

THE PROPORTION OF ABSTAINERS

There is a widespread impression that total abstainers are greatly in the minority in the population and among insured lives. To throw some light on this subject, two companies, at my request, followed back for a number of months their recent applications, which were in such form that the total abstainers could be distinguished from the users of alcohol. In the Postal Life 64 per cent. were abstainers; in the Germania Life 55.8 per cent. were abstainers. The rejection rate, excluding those who

were rejected on account of intemperance, was about the same in the two classes of applicants, suggesting that total abstainers are in fact only average people, not a small group of "health cranks."

In the New England Mutual an analysis of 180,000 cases insured during the past sixty years showed 24 per cent. abstainers and 11 per cent. rarely using alcohol, or about 35 per cent. practically abstaining from alcohol. The abstainers from tobacco were in about the same proportion. The low mortality among the abstainers in this company has already been mentioned.

The experience of the Life Extension Institute among the individuals it has examined is along similar lines. These examinations were for hygienic or life-lengthening purposes, and included large groups of supposedly healthy, "average"

people whose employers had subscribed for this service. Among industrial workers 45 per cent. were abstainers. Among commercial workers (low average age) 72 per cent. were abstainers.

The possible influence of psychopathic or "nervous" states and of excessive use of alcohol in the non-abstaining group must be considered, as already suggested. But here caution is necessary, and the evidence I have submitted bearing upon the characteristics of these groups and the standards maintained in their selection must be clearly borne in mind. That such conditions—existing psychopathic states and already attained intemperance—were factors of any considerable importance at the time of acceptance, is not to be regarded as a reasonable hypothesis. Psychopathic conditions, including excessive or palpably injurious indulgence in alcohol, de-

veloping after the "risks" had been on the books, must be accepted in the main as a charge against so-called moderate drinking. They are quite as much a possible effect of moderate drinking as any of the many other pathological conditions that are known to result from steady drinking, such as cirrhosis of the liver, fatty liver, or kidney affections, or the various forms of nervous disease or life-failure that may result from the psychic disturbances due to alcohol.

PART TWO

ALCOHOL AND PHYSIOLOGY

I

ALCOHOL AND MAN

THE opponents of alcohol as well as its apologists have always been prone to injure their arguments by exaggeration. The postulate that the alcoholic is always a defective is no more sound than the postulate that the criminal is always a defective. No man is perfect, and while a mental or nervous defective of a pronounced type is usually, though by no means always, an easy victim for alcohol, what alcohol will do to individuals far above this line is often a matter of circumstance and environment.

I have seen men with bad inheritance and many stigmata of nervous instability develop, under proper encouragement and suggestion, a successful

resistance to alcohol, and build up will-power and self-control; while, on the other hand, I have seen men with good endowment,—men who by no stretch of the imagination could be considered defective in a pathological sense,—buffeted by fate, tempted by environment, and prodded by suggestion, gradually yield to the steady use of alcohol—sometimes to complete downfall, sometimes to woeful lack of achievement. Every reader of this book can call to mind many fine men who have fallen by the wayside through alcohol,—men whom it would be scientifically ridiculous to call defective.

THE FALLEN—THE DEFECTIVE

After all, who are the “defective”? Where shall we draw the line? Who are the perfect men, these men who are

above all manner of temptation, for whom alcohol is innocuous? While there are many men who have inherited or acquired a stability of mind or nervous system that doubly assures them against attack, I have yet to see the man for whom the more or less steady use of alcohol did not carry some menace. In fact, we are considering the mass of the people, and not exceptional types such as the common drunkard, the insane, or the super-man. Among the mass of the people circumstances plus alcohol often constitute a dangerous combination; and alcohol often is responsible for the circumstances that make it dangerous.

FALLACIOUS THEORIES

The naïve assumption that alcohol impairs only the fundamentally unfit

will not bear analysis, and the development of such a hypothesis into such theories as those of Archdall Reid, who holds that alcohol, by weeding out the unfit, acts as a beneficial evolutionary influence, may easily be carried to a *reductio ad absurdum*. Such arguments apply with equal force to plague, yellow fever, consumption, pneumonia, and the other communicable diseases, as it is well known that those of low resistance usually succumb to such diseases. Let us then allow them full swing in order to eliminate the non-resistant! The problem of the survival of the unfit must be met in other ways consistent with modern science and altruism, and not through the aid of the corner saloon.

The question as to what the effects might be upon a group of men controlled in such a way that the influence of so-called moderate drinking could be

restricted to the degenerative or toxic effect on organic tissue, while the individuals are protected from life's vicissitudes, is almost purely academic. It could never be duplicated in real life. A group of insured lives must be considered in the moving equilibrium of actual workaday existence, and the many varied relations of that existence to the more or less steady use of alcohol in the quantities used by the mass of the people who drink, must be the touchstones applied to the life-insurance statistics presented in the previous chapter.

MASS EXPOSURE TO ALCOHOL

We must bear in mind that even so mild an indulgence as one or two glasses of champagne or beer three times a month would, in the course of twenty years, make seven hundred and twenty

exposures to alcoholic temptation, in addition to whatever disturbing effect on the moral, psychic, or physical condition such doses may have. Among two million individuals, even such slight indulgence would mean, in the course of one year, seventy-two million exposures to such varied adverse effects as there may be in small doses. Among those drinking every day two glasses of beer, the exposures to temptation and to further drinking among two million men would be in the course of one year seven hundred and thirty million, and in twenty-five years eighteen and a quarter billion.

Eighteen and a quarter billion exposures to alcohol might be compared to very distant artillery fire directed at an enemy. Many thousand shells are fired to produce a few fatalities. Many fail to hit, but in the long run there is a defi-

nite fatality. The impact of eighteen and a quarter billion doses of alcohol on a group of two million men must certainly place the group at a disadvantage as compared to a group that is not exposed to such impact, provided, of course, we find that the total effect of alcohol in the doses usually taken as a beverage is ever so slightly injurious in a direct way and carries any distinct danger of temptation to increased indulgence to the point where common observation shows it to be a deadly, destructive poison. What is the evidence along these lines?

Is there any sound reason to suspect alcohol of being the underlying cause of the greater part of the extra mortality unquestionably obtaining among users as compared to non-users? If we were confronted by an experience with users of ether or chloroform compared

to non-users (ether is widely used in East Prussia, not a prohibition state), should we for one moment question the fact of these drugs being the essential poisonous agent? Even though used in moderate quantities, should we question that cocaine or morphine or hashish or any other habit-forming drug was the chief factor in any extra mortality shown by its users? Only well-supported evidence showing that alcohol in the average quantities used by so-called moderate drinkers produces no bodily ill effects, either directly or indirectly, could justify seeking any other explanation than the influence of alcohol to account for the trend of mortality in the life-insurance experience.

Is there any well-supported evidence that the drinking of the average man is harmless? The laboratory must answer this question.

LABORATORY EVIDENCE THE
TOUCHSTONE

The most important work that has yet been done in the study of alcohol is that of the Nutrition Laboratory at Boston, of the Carnegie Institution in Washington, under the direction of Professors Raymond Dodge and Francis G. Benedict.

The work of Benedict and Atwater in establishing the fact that small amounts of alcohol, not to exceed 2.4 ounces daily, are completely oxidized in the body, and that by its tissue-sparing qualities alcohol may theoretically take the place of food, is well known. It is not so well known that Atwater condemned the use of alcohol as a food because of its cost and its possible ill effects on the nervous system.

DODGE AND BENEDICT'S EXPERIMENTS

Desiring to carry further these researches, a very elaborate plan has been outlined. The immense and comprehensive scope of the investigation planned may be judged by the fact that the physiological division of the research, as tentatively laid out by Benedict after conferences either by letter or in person with the leading physiologists and research workers of the world, includes seven main sections and one hundred and sixty subdivisions.

The psychological programme, which has already been carried out with the cooperation of Dr. F. Lyman Wells, includes four sections, covering an investigation of the effect of moderate doses of alcohol on the simpler reflex nervous mechanisms in the lower levels of the spinal cord, and also tests of its effect

on certain higher and more complex functions, as well as on memory and free association.

Benedict rightly says, with regard to the important higher mental and moral processes, "There is at present scant probability of securing experimental data of scientific reliability, owing to the difficulty of measuring them in any direct way. This technical defect is a serious limitation to all experimental investigation of the psychological effects of the ingestion of alcohol, since it is precisely in these directions that our general and scientific experience indicates that the effects of alcohol are most serious."

For example, the effect of alcohol on the mental processes of a subject quiescent in the laboratory, where it is impossible exactly to reproduce the conditions under which alcohol is usu-

ally taken, may be different from what they would be in social life. In convivial company there is a certain relaxation of control of the higher centres and a reinforcement of the lower centres which may reverse the effects of alcohol as shown in the laboratory. In working with small doses of alcohol we are operating within very narrow margins, and manifold factors may disturb the equilibrium of the experiment, even apart from varying individual susceptibility. It is well to bear this in mind in interpreting the facts just given to the public in the voluminous report of the Nutrition Laboratory:

The report is couched in rigidly technical and formal language, giving in detail the technique and results of the experiments. It is free from any suggestion of propaganda, either scientific or sociological, and practically free from

any discussion of the application of the knowledge in the solution of the alcohol problem.¹

¹ The investigation is planned to cover about ten years in time, and premature generalizations are distinctly avoided. Nevertheless, there is presented exceedingly important and definite evidence of the effect of alcohol in moderate doses, which has very significant bearing upon the interpretation of the life-insurance statistics.—THE AUTHOR.

II

PREVIOUS EVIDENCE SUMMARIZED

BEFORE proceeding to a summary of the results of these experiments it is desirable to state briefly the evidence previously presented by the world's leading investigators and note to what extent it is confirmed by the Nutrition Laboratory with its wealth of scientific apparatus, some of which, such as the electrocardiograph, has only lately become available for research work and has added much to the delicacy and precision of the psychological measurements.

The most important work along these lines has been done in Germany, and it is there that scientific opposition to the use of alcohol is strongest. Kraepe-

lin and his pupils have contributed most to our knowledge of the psychological effects of alcohol; they have done much to dispel the dogma that alcohol possesses stimulating properties and have plainly labeled it a narcotic.

ALCOHOL NARCOTIC, DEPRESSING

The work of Kraepelin, Kürz, Aschaffenburg, and others, has shown a distinctly narcotic or depressing effect from even small doses, such as a half to a whole litre of beer. A distinct impairment of the power to memorize numbers was found after the consumption of two to four glasses of beer. Habitual association of ideas and free association of ideas were also interfered with.

Vogt, of the University of Christiana, in comparatively recent experiments on his own person, confirmed the results of

Kraepelin and Smith, and found a reduction of 18 per cent. in the power to memorize Greek poetry. Six months later, when the poetry was reviewed, it was found that the lines learned on alcohol days were less readily relearned, thus suggesting the hypothesis that they were less clearly impressed on the memory while alcohol was circulating in the brain. Vogt found that about 15 cubic centimetres (four teaspoonfuls) of whisky on an empty stomach, or 25 cubic centimetres with food, distinctly impaired the power to memorize.

AMOUNT OF WORK LESSENERD

Aschaffenburg found that moderate doses of alcohol lessened the amount of work done by printing compositors and increased the liability to error. In his and Kraepelin's experiments, the reac-

Previous Evidence Summarized 69

tion time, or the interim that elapses between an irritation and a responsive movement, which can be measured within one one-thousandth of a second, was at first shortened under small doses of alcohol and later lengthened, suggesting a depression of the higher inhibitory centres and a release of the lower nervous mechanisms, with an acceleration of action characterized as "premature."

The testimony as to the effect on muscular efficiency and fatigue is somewhat conflicting, owing to the varying susceptibility of the many individuals used in the tests. Such workers as Dubois, Schnyder and Hellsten have found a total loss of working power, occasionally preceded by a temporary increase, variously ascribed to primary increase of interest, temporary stimulation or even temporary paralysis of the higher centres, resulting in acceleration of the lower.

Experiments with the ergograph—an instrument for recording the value of work done by muscular contractions—showed that any apparent stimulation was reflected in an increase in the number of movements, but not in their force or range, giving some support to the view that the effect of alcohol was a release of susceptibility or irritability rather than a driving force.

RIVERS'S CONCLUSION

Rivers, in 1908, noted the discrepant findings of various investigators, and was inclined to view the results of previous experiments as seriously affected by the personal equation and accessory factors other than alcohol, and by lack of proper checks and controls.

His own carefully checked and controlled experiments had failed to show,

on the whole, any stimulating effect on muscular efficiency from moderate doses of alcohol—20 to 40 cubic centimetres. (Four cubic centimetres are equal to one teaspoonful.) He states that sometimes a dose of 40 cubic centimetres of pure alcohol may produce a decided increase in the amount of work executed with the ergograph, but at other times the increase may be wholly absent and may possibly be replaced by a decrease.

With regard to mental work, Rivers concluded that the available evidence pointed to a decrease in the amount of work under the influence of alcohol, when there is any effect at all; but there are great individual differences. The analogy between the effect of mental fatigue and the effect of alcohol on muscular work is a striking feature of Rivers's work, and supports the view of Kraepelin that the effect of alcohol is

essentially central, acting directly on the brain and spinal cord.

The dulling of mental activity by fatigue is compared to the dulling of mental activity by alcohol; and the increased muscular activity noted by Rivers on his own person following mental fatigue is likened to the muscular activity sometimes noted after doses of alcohol.

The fact of wide variation in individual susceptibility is a matter of extreme importance in explaining the unfavorable effects of alcohol on large masses of men. In such masses will always be found a very large percentage of people who react unfavorably to it, as such subjects are always found in the small groups that have been selected with great care as supposedly normal subjects for investigation.

Also, as Rivers suggests, the similarity between the action of alcohol and that

of fatigue should make one very chary of concluding that any stimulating effect of alcohol on muscular activity is an indication of a physiological action which is beneficial to the organism as a whole, even in those supposedly favorable subjects where it is found to occur.

QUENSEL'S VIEWS

With regard to muscular efficiency, Quensel says of the investigations already mentioned that they "afford a full objective support for the truth of what practical experience teaches. From the sporting and military life many experiences are at hand which demonstrate the undesirability of using alcohol when the point is to keep the body for a longer period at its greatest point of strength and endurance.

"Experience has furthermore shown

that it is difficult and responsible work which suffers most from the influence of alcohol. Endurance, energy, concentration, suffer in the first place, while ability to execute an already familiar piece of work, or purely mechanical occupations, are inhibited to a far less noticeable degree." The danger of increasing indulgence being also freely admitted, it is difficult to understand his point of view that moderate indulgence in alcohol as a source of relaxation after work or fatigue is not to be condemned from the hygienic point of view.

The indictment which Quensel himself brings against the use of even moderate doses under ordinary circumstances does not consist very well with his indorsement of it as something to play with in relaxation. A wild animal that must be watched is no very safe play-fellow, and the record of alcohol in its influence on

mankind certainly justifies the claim that it needs watching.

ALCOHOL AND CREATIVE WORK

William James aptly characterized the psychic effect of alcohol as that of "narrowing the field of consciousness." Expansive as the drinker may feel, his intellectual world is restricted by alcohol, according to common observation and the testimony of many unprejudiced brain-workers. The man who leans on alcohol cannot, of course, do creative work without it until he is put in a normal condition; but there is little evidence that alcohol releases any higher mental activities, unless we except the case of the psychopath, whose brain cannot function without the drug upon which it has become dependent. This will receive further consideration in discussing the findings of the Nutrition Laboratory.

Another important system to consider in its relation to alcohol is the so-called "autonomic system," the nervous mechanism for maintaining in equilibrium the circulation of the blood, the activity of the heart, and the tone of the blood-vessels, as well as other glandular and organic functions.

ALCOHOL AS A MEDICINE

The most extensive use of alcohol in medicine has been that of a heart stimulant. In every form of heart-failure, whether of acute shock or the depression of acute illness (especially in typhoid and pneumonia), alcohol was formerly a standard routine remedy, to be used on the first signs of a falling circulation, in traditional tablespoonful doses at intervals of several hours, and occasionally in much larger quantities.

We now know that such value as it possessed in acute illness was largely due to its fuel-value, to its property of sparing tissue and thus replacing nutrients in the diet which were often mistakenly withheld in the graver stages of acute illness.

While there are still a few authorities who believe that alcohol has some beneficial effect on the circulation, in spite of its absolute failure to show any value as a direct heart stimulant, the pendulum has swung very far in the other direction, and alcohol is now seldom used in acute illness except as a substitute for food and in cases where previous steady drinking has made it unwise to withdraw it. Crile, Cabot, Dennig, Hindelang, Grünbaum, and others, have failed to show any increase in blood-pressure from its use in therapeutic doses in man. Although very small doses in animals have shown some slight stimulating effects, the de-

pressant after-effects are very quickly reached. Blood-pressure, however, is not an infallible test in this regard, and there is other evidence to show that alcohol not only depresses the nervous centres controlling the tension of the blood-vessels and thus lowers blood-pressure, but depresses the inhibitory nervous centre that controls the rate of the heart, thus accelerating the heart beat without adding to its power. It takes the "brake" off the heart, but adds nothing to its driving force.

As a food, too, it is discredited in acute disease, and substances like sugar are now employed as affording almost equal fuel value without the possible dangerous effects on the circulation and nervous system. The "high calorie" diet in typhoid, for example, now elbows alcohol out of the sick-room, even as an alleged emergency food.

ALCOHOL AND RESISTANCE

On the protective qualities of the blood, its complex and as yet only dimly understood mechanism for resistance to infection, alcohol exerts very definite effects. While there is much conflicting evidence, there has grown up, not only a clinical aversion to the use of alcohol in such conditions as tuberculosis and other infections, but a body of evidence justifying this reversal of former clinical practice.

Fillinger found the resistance of the red blood-cells much reduced after administration of champagne to healthy human subjects, and similar results were found in dogs and rabbits. Weinberg confirmed these results by similar methods, showing that 20 per cent. of the red cells lose their resistance after the administration of 450 cubic centimetres

of champagne. Little effect was found on the white blood-cells by Parkinson in a series of careful tests, except when very large doses were continuously taken: that is, the power of these cells to destroy bacteria (phagocytosis) was not materially affected.

Laitinen was convinced that very small doses, 15 cubic centimetres, for instance, distinctly lowered the resistance to typhoid after prolonged administration. Muller, Wirgin, and others have shown that alcohol restricts the formation of "antibodies" (the function of which is to resist infection) in the blood of rabbits. Rubin demonstrated that alcohol, ether, and chloroform, injected under the skin, render rabbits more vulnerable to streptococcus (blood poison) and pneumococcus (pneumonia) infection.

Our knowledge on the subject has lately been reinforced by Reich, of the

University of Munich. He failed to show any increase of protective activity (phagocytosis) against tubercle bacilli in the white blood-cells of abstainers as compared to alcohol users, but noticed that phagocytosis of typhoid bacilli by the cells of abstainers was more readily effected. The bactericidal qualities of the blood serum of abstainers were also more active against typhoid bacilli. Furthermore, the resistance of red blood-cells to salt solution was lowered in proportionate relationship to the degree of alcoholic indulgence.

DEGENERATIVE EFFECTS

Laboratory or clinical evidence is, of course, lacking as to the effect of small doses of alcohol on the kidneys, liver, and the structure of the blood-vessels. Such minute and chronic changes as

there may be cannot be readily ascertained by such investigations, and we must draw our conclusions as to the probable effect of continuous so-called moderate drinking on these organs from the well-known effects of excessive drinking in bringing about degenerative changes in the liver, kidneys, and blood-vessels.

It is possible that light may be thrown on this matter by the researches of the Nutrition Laboratory. From the insurance experiences we are at least justified in assuming that even the moderately drinking classes are more subject to these chronic organic affections than those who abstain.

So far as the direct action of alcohol on the stomach and its functions is concerned, there is little evidence that in dilute solution (less than 10 per cent.) it exerts any restraining influence on

digestion. Indeed, its use tends to encourage over-feeding and add excessive food-consumption and absorption to the fuel-value of alcohol. Indirectly, it may thus tax the digestive system, and by causing undue accumulation of weight,—especially among beer-drinkers who drink to excess,—add the peril of obesity to that of the toxic effect of alcohol on brain and circulation.

It may be asked why, if alcohol thus promotes nutrition, it is not serviceable in wasting diseases. The answer is that the price paid in toxic effect is too high. The unfavorable influence already noted on the brain and blood and circulation counterbalances its food-value for those who need to gain weight, and for those who are already in the heavy-weight class it is a double handicap.

FOOD VALUE

In the past few months further light has been thrown upon the alleged food-value of alcohol. The one great therapeutic stronghold still held by alcohol is diabetes. Even Ewald, and others strongly opposed to the use of alcohol generally as a therapeutic weapon, concede its value in this disease because of its alleged action in preventing the development of acidosis when starches and sugars are withdrawn or greatly reduced in the diet. That this view is based on dogma and not on scientific fact has lately been shown by Higgins, Peabody, and Fitz in their experiments at the Carnegie Institution and at the Peter Bent Brigham Hospital, where carefully controlled experiments on normal human beings showed not only an absolute lack of "antiketogenic" or acidosis-preventing

influence on the part of alcohol, but an actual acceleration of such conditions by its use, the measurements being made by the most delicate and accurate methods available to science (oxygen tension of alveolar air).

This evidence concerns normal people as well as diabetics, because the trend of modern diet is toward the overuse of acid-forming foods, such as eggs, meat, fish, cereals, and an insufficient use of base-forming foods, such as most fruits and vegetables. Those who eat inordinately of these concentrated flesh foods and also drink alcohol, are increasing the tendency to acidosis, a condition which in its milder form is often given the absurd misnomer of "biliousness." [Bile never has anything to do with the symptoms usually charged against it.]

Without going further into the physiological and psychological effects of al-

cohol as ascertained, we may sum up the evidence prior to Dodge and Benedict's researches by stating that alcohol has been found to be a depressant, a narcotic, often exerting, even in small daily doses, an unfavorable effect on the brain and nervous functions and on heart and circulation, and lowering the resistance of the body to infection.

PART THREE

ALCOHOL AND HUMAN
EFFICIENCY

I

LATEST LABORATORY EXPERIMENTS

IN a preceding chapter, we sought to establish from reliable data the fact that upon the mind and body alike alcohol, even in small regular doses, must exercise a depressing effect. Let us now inquire to what extent the experiments in the Nutrition Laboratory confirm these findings, and whether or not any new evidence, either for or against alcohol, has been elicited by the latest methods of research with all the formidable armamentarium of the modern psychological laboratory.

HOW CONDUCTED

Twelve subjects were used in these tests, two of whom were psychopathic;

but the results found in the psychopaths were separated from the totals of the other findings and grouped for special study. The psychological program, carried out by the Nutrition Laboratory with the coöperation of Dr. Wells, covered the following investigations:

First, an investigation of a very simple reflex mechanism at the lowest level of the spinal cord, the patellar reflex or knee-jerk, elicited by sharply striking the tendon of the knee just below the knee-pan. Even in this simple experiment minute and delicate precautions were taken to control the test. The blow was administered by a magnetically released pendulum-percussion hammer, the reaction being recorded in a Blix-Sandeström kymograph, run at a rate of 100 millimetres per second. The variations in the reactions are recorded to a thousandth of a second.

Latest Laboratory Experiments 91

The normal subjects were selected with care as individuals of average habits, temperate users of alcohol, apparently free from any peculiar susceptibility or resistance to its effects.

The alcohol was administered in two separate doses, "A," or 30 cubic centimetres, and "B," or 45 cubic centimetres, well diluted and its flavor disguised in various ways to avoid the effect of suggestion.

EFFECTS ON LOWER SPINAL ARCS

Summing up the results of the test, it was found that alcohol in the doses given produced a marked depression of the patellar reflex as shown in a decreased response, or a slower response, or both. As in all such tests, there were wide individual departures from the average, but the data on the whole un-

equivocally support the conclusion. The latent time of response was increased 10 per cent., and the degree of thickening of the muscles decreased 46 per cent. In fact, so extreme was this effect that it made it impossible to measure the knee-jerk of several subjects after the larger dose "B."

EFFECTS UPON THE EYES

The next test was that of the protective eyelid, or wink reflex. This is elicited by a sudden stimulus, such as light or noise. In the experiment the sound stimulus was employed as giving more satisfactory results, and the nicety with which the tests were controlled is evidenced by the fact that artificial eyelashes of uniform length were glued to the eyelids of the subjects, so that the photographic record of the wink, or lid

reflex, might be free from error due to the varying length of the subjects' eyelashes. This reflex shows the second largest effect of alcohol, the latent time of response being increased 7 per cent. and the extent of the lid movement decreased 19 per cent. This depression, or decreased excitability of the lid reflex varied directly with the dose of alcohol.

Having disposed of these simple reflex mechanisms with very decisive evidence of the effect of moderate doses of alcohol in depressing them, the more complex mechanisms at higher levels of the nervous system were approached: namely (1) eye-reaction to suddenly appearing stimulus, (2) speech-reaction to visual word-stimuli.

Without going into the technical detail of the test, it is sufficient to say that the first test involved the movement of the eyeball in reading typewritten let-

ters on small uniform strips of paper in an exposure apparatus that presented them suddenly to view in one of six possible positions. A photographic camera record of the eye-movement was made.

On this reaction the effect of dose "A," 30 cubic centimetres, was an acceleration of response, while dose "B" frankly depressed the reaction and increased the latent time of response, agreeing with the simpler reaction experiments of Kraepelin to which I have already referred.

READING ISOLATED WORDS

The next experiment was on the effect of alcohol on the reaction-time in reading isolated words, a specially devised tachistoscope, or exposure apparatus, being used. The stimulus words and a

fixation mark are placed on a rapidly revolving strip, which renders the words illegible until the motion of the strip is suddenly checked, when the exposure of the word is simultaneous in all its parts. Twenty-four words of four letters each were used throughout the year, the entire set being used in each experiment. The subject was required to hold a voice-key to the mouth and speak the words as soon as they appeared, the breaking of an electrical circuit marking exposure and reaction.

Dose "A" increased the latency of the reaction about 3 per cent. in four out of six subjects; but according to Benedict's method of averaging the percentile differences, he regarded the experiment with dose "A" as showing negative results on the reaction. Dose "B," however, showed consistent increase of the latent time of response, and there was

a positive depressant effect for both doses of 3 per cent.

ON ASSOCIATION OF IDEAS

The next step was investigation of the highest complication of the reflex mechanism that was considered justified by laboratory methods, that of free association of ideas. In this experiment the stimulus to the reaction is a word spoken by the operator and a response word spoken by the subject—the first word that occurs to him after the stimulus word is spoken. Complicated apparatus is used in this test, which does not require description. The experimenter's comments on these tests are that only very few and small consistent effects were found measurable by available technique.

ON MEMORY

Tests of the power to memorize were next on the program. In Kraepelin's and Vogt's experiments on memory methods were employed comparable to the exercise of this function in daily life: for example, in Vogt's, the memorizing of verse, and in Kraepelin's work the continuous memorizing of a series of numbers. The methods employed by the Nutrition Laboratory were in the nature of "short cuts" applicable to laboratory work and measurable by laboratory technique rather than by subjective impressions—a more mechanical method and one subject to some question as to its complete testimony regarding the probable effect of alcohol on memory processes exercised in daily life, where elements of autogenic reinforcement might be lacking.

The theory of the tests employed is that any saving of time between the reaction-time in responding to the first exposure of a series of words and the reaction-time in responding to a second exposure must be due to the influence of memory. The experimenter admits that words are not usually read during a gradual exposure, certainly not during the kind of exposure employed in the laboratory. While different subjects varied widely in these tests, the total effect of dose "A" on the group showed no predominating tendency of alcohol. It should be noted that the effect of dose "B" was not tested, which seems unfortunate.

Next on the program was the Sensory Faradic Threshold, an investigation of the subject's sensitivity to electric stimulation. The so-called threshold to electrical stimulation was, according to the

tests, raised 14 per cent. by moderate doses; that is, there was decreased sensitivity, which is consistent with the other depressant effects noted.

EYE AND FINGER MOVEMENTS

Eye-movements were selected as the basis of the next test, because simple movements of the eye in fixating seen objects are relatively independent of voluntary control. Photographic recording apparatus similar to that employed for eye-reactions already described was employed, except that two constant fixation marks were used, so placed that in looking from one to another the eye traveled through twenty degrees on either side. On signal the subject is required to look from one point to another, back and forth as rapidly as possible, until the signal to stop is given at the end of five

seconds. The velocity of these eye-movements was decreased 11 per cent.

Next in order was the investigation of the influence of alcohol on certain finger-movements. In this test the subject is harnessed to an exceedingly delicate and complicated set of apparatus, including a string galvanometer and an electro-cardiograph for recording the electrical reaction of the heart mechanism. Electro-cardiograms, or the pulse records, as well as the finger-movements, were recorded in this experiment. When the record started, the operator said, "Go," and the subject was required to move the middle finger back and forth as fast as possible until signaled to stop. With all the subjects, the speed of this "reciprocal innervation" of the finger was decreased 9 per cent.

ORGANIC EFFICIENCY DECREASED

The pulse records taken during these tests developed evidence of considerable importance. There has been much conflict of opinion among physiologists regarding the effect of alcohol on the pulse, but the evidence from these carefully checked experiments with the most delicate modern instruments seems conclusive, and is thus commented upon in the report: "In view of the large amount of our pulse data and the thoroughness with which it was read and elaborated, we believe that the accelerating tendency of alcohol on the pulse-rate of normal human subjects during moderate mental and physical activity may be regarded as certain. We also believe that the evidence is sufficient to show that such relative acceleration must be referred to a partial paralysis of the cardio-inhibi-

tory centres." In other words, along with depression and retardation and decreased irritability of a number of related neuro-muscular processes is found an acceleration of the pulse, giving "a clear indication of decreased organic efficiency, as a result of moderate doses of alcohol." The "brake" is taken off the heart, but there is no direct stimulation of the heart-muscle.

II

ALCOHOL A DEPRESSANT

THE question now arises as to what effect this evidence has on alcoholic tradition as established by previous investigations. Unquestionably, the modern view of alcohol as essentially a narcotic is fully supported; but this evidence goes further and fails to disclose any evidence of even partial stimulation of any muscular or organic function. Alcohol is found to be uniformly a depressant.

It is, of course, unthinkable that such positive and definitely depressant effects could seek out only the lower nervous mechanisms and not in any way reach the centres involving the more complex and controlling functions of the cerebro-

spinal system. It is postulated by the investigators that the effect on these centres is resisted through their power of "autogenic reinforcement"—a necessary function of such centres for preservation of the organism through guidance and control of its more important activities. Evidence of such reinforcement was found in the experiments, one subject being able to rouse himself from temporary somnolence and quickly bring up his performance to normal. We frequently see instances of men "sobering up" under the effect of some shock or sudden demand on their control.

EYE-REACTION

Reasoning along these lines, the investigators say with regard to the effect of 30 cubic centimetres of alcohol in accelerating the eye-reaction,—

“It is not without significance that under almost identical circumstances of a complex ‘choice’ reaction in the process of training, Frankfurter found typewriting errors enormously increased by alcohol, while the speed was occasionally increased. His introspection is not irrelevant: ‘I had the feeling that the fingers ran faster than I could find the right spot for the stroke. I often struck keys against my will, so that I must voluntarily inhibit the movements in order not to make a mistake at every letter.’

“There can be little doubt that, even in small experimental doses, along with and as a part of the general depression, we have clear indications of a paralysis of inhibitory or controlling factors. These may on occasion suffer greater relative depression than the direct process, as in the pulse. When this

depression of controls is combined with a reinforcement caused by the experimental instructions, suitable conditions are provided for the slight reinforcement of reactions that rapidly pass over into depression with slightly larger doses. It seems probable, too, that we have herewith come upon the grounds for a wide variety of effects which are commonly observed in the social use of alcohol, when circumstances give the reinforcement and alcohol reduces the inhibitions.

APPARENT EXHILARATION

“Whatever may be the effect in isolated tissue, our data give clear and consistent indications that the apparent alcoholic depression of neuro-muscular processes is a genuine phenomenon that cannot be reduced to the excitation of

inhibitory processes; but that, conversely, whenever apparent excitation occurs as a result of alcohol, it is either demonstrably (pulse-rate, reflexes, memory and threshold), or probably (eye-reaction), due to a relatively overbalancing depression of the controlling and inhibitory processes."

Another interesting and suggestive fact was that the maximum effect of alcohol and the beginning of recovery occurred within the three-hour interval of the experiments. In general it was found that the reflexes recovered first, suggesting the possibility that the partial recovery of the lower centres was due to increasing paralysis of the higher ones.

THE SIMPLER NEURAL ARCS REACTION

There is, as the investigations show, a strong discrepancy between their find-

ings and those of the Kraepelin school with regard to the incidence of these depressant effects on the various levels of the nervous system. The simpler neural arcs in the lower levels of the spinal cord are first and most profoundly affected. There is no evidence of acceleration or facilitation of these separate neuro-muscular processes by primary paralysis of the higher inhibitory centres as predicated by Kraepelin, except in the instance of the eye-reaction. Here the effect of 30 cubic centimetres was contrary to that of 45 cubic centimetres, and, as the investigators state, corresponded rather closely with Kraepelin's simple reaction experiments. It is pointed out, however, that at the time of Kraepelin's experiments the conception of all sensory and motor processes as a resultant of complex stimulating and inhibiting factors was not so well estab-

lished in the psychophysiological tradition as now. So-called "discrimination" and "choice" reactions are viewed more as a complex of exciting and controlling tendencies, with great variability in the adequateness and completeness of controls.

ANALYSIS OF DRUNKENNESS

We see confirmation of this in the social use of alcohol. Under circumstances of conviviality and relaxation the effect of alcohol on the higher mental processes is not resisted; there is no autogenic reinforcement of these functions and their control is relaxed and exhibits the full narcotic effects of alcohol. But the lower mental and nervous activities are reinforced by suggestion, and we have released tendencies to animal indulgence and foolish uncoordinated acts of mind and muscle, vary-

ing in degree according to the amount of indulgence, the susceptibility of the individual, and the character of the environment. These considerations must qualify and govern any implications derived from the laboratory experiments with regard to the slight apparent effect of alcohol on memory and free association.

The "complex of exciting and controlling tendencies" that may exist in the ordinary environment outside the laboratory, especially under the conditions where alcohol is usually taken, must be reckoned in the total possible effect of alcohol. It seems clear that the preponderating effect of alcohol is central, and that such local effect as has been shown on isolated muscle, as by Lee's experiments, is overbalanced by its central nervous effects.

ALCOHOLIC DEPRESSION NOT
CONSERVATIVE

Answering the question, "Is alcoholic depression a conservative process?" the experimenters say, "The fact of increased heart-rate from a given kind and amount of mental work absolutely prohibits us from regarding the neuromuscular depression incident to alcohol as a conservative process like sleep."

If we wipe off the slate all previous evidence of the unfavorable effect of moderate doses of alcohol on the human organism, and consider solely this preliminary study of its effects on certain important bodily processes that have to do with safeguarding life, what inferences may we draw from these remarkable experiments, so carefully checked and controlled, as to the total effect of moderate indulgence in alcohol on large

masses of men? Is there a scintilla of evidence to support the view that such effect is negative, let alone conservative or beneficial?

Surely not. On the contrary, if we knew nothing of life-insurance statistics and were asked to consider alcohol as a newly discovered drug, these experiments would amply justify the belief that the more or less steady use of the very moderate doses employed in the tests would place the human organism at a disadvantage in the struggle for existence, entirely apart from the well-recognized danger of increasing indulgence, and exposure to manifold destructive agencies.

THE ONLY SAFE COURSE

If alcohol is the key that unlocks the door to the chamber of disease, degen-

eration and life-failure, we must hold it solely responsible for the results that follow its use. The only safe course is not to use the key. Some individuals may enter the chamber for a little while and escape without noticeable injury; but given two million supposedly sound, healthy men, and let them one after another enter that door, and there can be no reasonable doubt of the result. Many will come out smitten as from the war zone; many will not come out at all. Given two million men of the same type, who pass by the door and do not use the key, and, considering the exactly measured evidence from so many sources, as well as the evidence of common observation, who can question that at the end of twenty-five years, the first group will be decimated as compared to the second? If the life-insurance statistics showed any other result, they would be

inconsistent. Whether the total effect is directly due to indulgence *strictly maintained within the limit of so-called moderation* is a purely academic question.

As practical men, what we wish to know is: What does it cost us in the long run to drink alcohol? The evidence that society is paying a heavy bill for the indulgence cannot be longer disregarded by conservative men, entirely outside of the propaganda for drastic methods of reform.

FALLACY OF "SOCIAL INSTINCT"

The contention that there is an in-born social craving for alcohol is pure dogma. Man craves enjoyment, relaxation, change. He seeks to anticipate good fortune and to quiet the activity of those conservative faculties which

cause him to worry over trouble and life-struggle. He finds that alcohol apparently assists him in attaining these ends, and he drinks it for these effects, not because he is "thirsty" or "craves" alcohol *qua* alcohol, without any previous knowledge of its effects. Many individuals who are wrecked by alcohol would lead normal lives undisturbed by any "craving" for it if they were protected from the repeated experience of its effects.

It is a mistake, of course, indiscriminately to ascribe all the ills to which flesh is heir to alcohol. Total abstainers die of degenerative affections, and I am honestly convinced that much of the degenerative disease charged against alcohol is due to mouth-infection and other focal infection. There is good evidence, however, that focal infection in the alcoholic is more lethal because

of the lowered resistance and the collateral pressures on the organism. Alcohol has enough to answer for without making it the object of random and ill-considered charges.

III

THE EVIDENCE INTERPRETED

WE have measured the difference between so-called moderate drinkers and abstainers, which gives us a hint of the powerful effect of alcohol on mortality, but we have not measured the effect of the widespread grossly excessive use of alcohol among all classes of the population.

A DESTRUCTIVE FORCE

After twenty-five years of experience in the close personal observation and physical examination of all types of men, from laborers to statesmen and leaders of scientific thought, and in the sifting and weighing of evidence relating to the influences that affect longevity as revealed by the experience on large masses

of men, my cumulative judgment is that alcohol is a destructive force, wholly evil in its total effects. I deprecate the too prevalent tendency to apologize for alcohol, to deal gently and tenderly with it, instead of bringing it to the bar of human judgment to answer for its misdemeanors and justify its right to be exposed for sale on the street corners as a beverage harmless for the average man.

There are two principal factors to be reckoned with in the lenient mental attitude toward alcohol. One of them arises from very human tendencies—from the aversion to being regarded as a “crank,” a “spoilsport” or “killjoy.” Physicians are no exception to the rule that the average man likes to be thought a “good fellow” in the best sense of the term. The second factor is the view commonly held, even by physicians and pathologists, as well as actuaries, that

there is a certain law of mortality, that the span of life is fixed, that the observed habits of mankind are a part of his natural adjustment, and that there is no use of disturbing him; that, in common parlance, he cannot "beat the game," so far as greatly extending his life or checking the so-called ravages of time is concerned. That death is always a pathological finish to some form of poison, strain, starvation, injury, or bacterial infection, and not the effect of time, is a concept only just taking form as we gain knowledge. Time can no more kill a man than the Rule of Three can kill him. Time is a mere mathematical abstraction, a synthesis of space and motion.

CAUSES OF IMPAIRMENT

Insofar as we can discern and neutralize the influences which are inces-

santly at work destroying the cells of our bodies, to that degree we shall perform a service far more important than that of adding a few years to existence—the service of lifting mankind to higher planes of living, where sordid misery and needless physical sufferings and handicaps may be reduced to a minimum.

The unbiased mind must accept the implications flowing from the impartial business investigations of the life insurance companies, confirmed by the equally impartial labors of the laboratory. Can it be questioned that alcohol is one of the forms of poison which, among other factors, is responsible for the gradual bodily impairment and decay which we unthinkingly ascribe to time, and that it consistently imposes a burden of poverty, disease, insanity, and crime, which, regardless of debate as to its exact math-

emational degree, not only warrants, but demands, energetic action for its control as a social evil?

ALCOHOL OR THE BABY?

As to its effect on progeny, the degree of this effect in man is debatable, but there is positive proof of an extremely adverse influence on the germ plasm of animals, as shown by Stockard. Until the degree of this influence in man is determined, which should properly receive the benefit of the doubt—alcohol or the baby?

Within the past few years, medical literature reveals a rapidly changing attitude with regard to alcohol. The leading medical journals are strongly anti-alcohol, and there is evident a growing sense of the tremendous responsibility resting on the scientific man who

sanctions an indulgence which may lead to more misery and disease than he can cure or prevent through a life-time of surgical or therapeutic endeavors.

BEER AND ALCOHOL

Furthermore, alcohol is alcohol, either in whisky or beer. It is nonsense to claim that beer is a hygienic drink. It is drunk chiefly for its alcoholic effect, and if the alcoholic effect is produced, the danger of alcohol exists. Any one who doubts that beer can produce a certain form of intoxication need only visit the saloon and watch the beer-drinker in various stages of befuddlement or excitement. If beer does not intoxicate or produce any alcoholic effect, what becomes of the "racial craving for stimulants" which it is said to satisfy? Furthermore, heavy beer-drink-

ing, as in the case of brewery employees, adds the danger of excessive fluid intake, entirely apart from alcohol. The heavy mortality of brewery employees is sufficient evidence that beer, so far as its effect on masses of men is concerned, is not a hygienic drink.

ALCOHOL AND HORMONES

There is abroad in this land a cynical feeling that a man must break some law of health in order to have a good time; that the hygienic life is a dull existence; that all the best things are forbidden. This is superficial, admittedly foolish, reasoning. The thoroughly healthy man has hormones circulating in his blood, derived from various organs and glands, that make him far more thoroughly alive to the best things in life than the narcotized and poisoned, self-indulgent

high liver. Do you ever view with envy the wild hilarity of young people who have abounding health? This is due to hormones. Alcohol cannot really take the place of hormones, although it is used for this purpose. It is an imitation hormone.

Finally, whatever view one may take regarding the effect of alcohol on a sound, strong, resistant body, there is no question of its seriously harmful effect on an impaired or non-resistant body. All men who drink alcohol should be thoroughly examined at least once a year, and learn what is happening in their circulation, kidneys, and nervous system. This is a wise precaution for anybody, but the alcohol-user only accelerates the "slow suicide" of unhygienic living by neglecting it.

SUPPLEMENTARY NOTES

SPECIAL PHASES
OF THE
ALCOHOL QUESTION

FOOD VALUE OF ALCOHOL

The experiments of Atwater and Benedict have frequently been quoted as establishing a certain food value for alcohol. They have been made much use of by those financially interested in proving alcohol a wholesome article of consumption. This is a matter worth discussing at the present time, when legislation is contemplated for controlling the production of alcohol on the ground that food greatly needed in the present crisis is destroyed in the process of its manufacture.

Atwater and Benedict had the proper scientific attitude toward alcohol. They did not look upon it either as a demon or a demi-god, but as a chemical combination that was a legitimate subject

of biochemical investigation, and the results of their experiments were reported with conscientious care. The warning was insistently given by Atwater that alcohol must be considered as to its total effect and not as to its partial nutritive effects.

OXIDATION OF ALCOHOL

Goddard had previously administered diluted alcohol to a fasting dog and found that 16 grains of absolute alcohol had disappeared in five and one-half hours, only 5 per cent. of which could be recovered. In other words, 95 per cent. had been oxidized or burned up in the body. By the same reasoning we would expect a man weighing 160 pounds to oxidize six ounces of whiskey at one dose. Atwater and Benedict actually found that healthy men could oxidize all but 1.9 per cent. of

six one-ounce doses given at intervals during the day, the unoxidized portion being recovered from the breath and urine. It is often naïvely stated that as ordinary amounts of alcohol are completely oxidized by the body, alcohol is not harmful in such amounts, although common observation shows that a one-ounce dose of whiskey excites a palpably injurious effect in that it disturbs the control of the nervous system, and, if repeated six times as in the tests, will impair the functional efficiency of brain and nervous system. This is a matter of common lay observation. We have seen in the text how even smaller doses impair organic efficiency, when the effects are carefully measured in the laboratory under the most rigid control. It is interesting to note that Benedict, the co-worker of Atwater, many years ago, in establishing the alleged food

value of alcohol, enjoys the distinction of showing recently by the most delicately controlled experiments that alcohol is absolutely excluded from the food class because of its toxic effects on the nervous and circulatory systems.

The question as to whether alcohol has a food value is therefore purely academic, just as the question as to whether ether has a food or fuel value. Unquestionably it has, in the sense that alcohol has, and so have chloroform, and tincture of iodine, and the whole list of officinal tinctures that contain alcohol, but no one would justify the administration of tincture of iodine as a food. Its poisonous qualities exclude it from consideration. When it is stated that alcohol has a food value, many people suppose that it contains nourishment in the nature of tissue-building elements. While it is true that malt

liquor contains some nitrogenous nutrients, alcohol itself is available only for oxidation and could serve as a food only by sparing the destruction of tissue and taking the place to some extent of fats and carbohydrates in the diet. But why replace these true nutrients by a false nutrient? The folly of doing so is now recognized in medicine and surgery.

Certain sugars—milk sugar, cane sugar, and fruit sugar—are burned or oxidized within ten minutes after being taken into an empty stomach. Alcohol burns in from five to eleven minutes after being taken into an empty stomach, depending upon the metabolism of the individual. Lately attention has been called to the fact that the oxidation of alcohol, which takes place largely in the liver, is a protective oxidation, not for the production of energy, but for the destruction of alcohol in order that the

body may be protected from its influence, and that alcohol is not available in a true sense for energy, for heat production or for maintaining muscular, glandular and organic activity. It is pointed out that alcohol is a poisonous product of the yeast cell, and that the yeast cell itself is poisoned by alcohol if present in the strength of 15 per cent., just as the human body is poisoned by a certain excess of its own metabolic products such as uric acid, and xanthin bodies. These are oxidized chiefly in the liver; and the experiments of Reid Hunt, Beebe, Mendel and Hilditch have thrown considerable light on this subject. There is reason to believe that the liver when busy oxidizing alcohol is not "onto its job" of oxidizing body poisons generated in the body, as evidenced by the increased excretion of uric acid while taking alcohol.

Beebe sums up the results of his own experiments as follows:

"1. After these experiments there is no doubt that alcohol, even in very moderate amounts, causes an increase in the excretion of uric acid.

2. The following points indicate that the effect is due to a toxic influence on the liver, thereby interfering with the oxidation of the uric acid derived from its precursors in the food. Alcohol taken without food causes no increase. Alcohol is rapidly absorbed and passes at once to the liver, the organ which has most to do with the metabolism of protein cleavage products.

3. The increased excretion means that a large quantity of urates has been produced and not that more of that which is already present has been excreted.

4. If we accept as the origin of the increased quantity of uric acid the im-

paired oxidation powers of the liver, the results of these experiments will have greater significance than can be attributed to the uric acid alone.

5. The liver performs a large number of oxidations and syntheses designed to keep toxic substances from reaching the body tissues, and if alcohol in the moderate quantities which cause the uric acid excretions impairs its power in this respect, the prevalent ideas regarding the harmlessness of moderate drinking need revision."

Professor W. S. Hall has made the following interesting and suggestive comments on the subject:

"THE ENERGY FROM ALCOHOL NOT AVAILABLE.—Is the energy liberated in the oxidation of alcohol in the liver available for the use of muscles, nervous system or glands? If this question is answered affirmatively, then alcohol is a

food. If negatively, then alcohol is not a food.

“All body oxidation may be classified in two groups: (1) *Active Oxidations*, which take place in the active tissues, muscles, nervous system or glands,—and take place incident to action. Active oxidations are under perfect control of the nervous system and are proportional to normal activity. (2) *Protective Oxidations*, which take place in the liver. This class of oxidation process is wholly independent of the usual tissue activity, and is proportional to the ingestion of toxic substances and independent of muscular action, brain action or gland action (other than liver action),

“If the oxidation of alcohol in the liver belongs to Class 1, the following consequences should be found: First, the ingestion of alcohol would lead to an increased muscular power and an in-

creased capacity for brain work, and increased glandular activity. Second, the ingestion of alcohol would serve to maintain body temperature in the healthy individual subjected to low external temperature. Third, the increase of muscle, brain or gland activity would be proportional to the amount of alcohol ingested. Now laboratory observations and general experience show that none of these things is true. That is, the ingestion of alcohol decreases muscle, brain and gland work and depresses body temperature when external temperature is low. The oxidation does not therefore belong to Class 1.

“If the oxidation of alcohol in the liver belongs to Class 2, the following consequences would be found: First, the ingestion of alcohol would be followed by its early oxidation in the organ in question. Second, if the oxidation ca-

capacity of the liver is limited this capacity may be overloaded by exceeding the physiological limit of alcohol. Third, if the oxidation capacity of the liver is taxed nearly to its limit, by the oxidation of uric acid, xanthins and other toxic substances, the ingestion of alcohol may seriously interfere with this protective oxidation by overtaxing the capacity. Fourth, if the oxidation capacity is overtaxed, an excess of uric acid, xanthin bodies, and other toxic substances will get by this portal and reach the active tissues of the kidneys. Now all of these things take place, so we are forced to the conclusion that *the oxidation of alcohol is a protective oxidation.*

"Alcohol is, therefore, a toxic substance and not a food in any sense.

"In the light of this presentation the significance of Dr. Hunt's work becomes very clear. The alcohol given to the

animals taxed the oxidation capacity of the liver to the limit and left the organism defenseless against bacterial or other toxic substances."

RESPONSIBILITY OF THE CITIZEN TO THE STATE AND FAMILY

The average American citizen, while priding himself on his patriotism and his love of liberty, construes that liberty in a strongly individualistic sense. The excess to which this individualistic spirit has been carried is reflected in a homicide rate and a typhoid rate that leads the world. The true American does not take kindly to restraint in the matter of poisoning himself or his neighbors, and his tolerance of killings and lynchings suggests the need of acquiring a greater respect for the law and for the greatest good of the greatest number. Self-discipline, self-restraint, and respect

for authority, are not the distinguishing marks of American character, and it is to be hoped that during the present war these qualities, which we must believe are latent in the American race, will be brought to the surface and restore the proper balance to American character.

In the present crisis the self-indulgent individual will have to yield to national necessity. There is no time to apologize to a citizen for disturbing him in his pet indulgences, when men are volunteering to give their lives and all that they hold most dear next to honor. A man who is too craven and self-indulgent to curb his appetites will not shine in an enviable light and no one will waste much time arguing with him. If his immoral indulgences threaten the nation with a tremendous venereal peril as an aftermath of the war, his opportunities for immorality must be restricted by police

and military control, and governmental regulation. If his drinks involve the destruction of food that is needed for the nation and the nation's dependents, his drinks must stop. Thus it is that in a period of great national peril, the harmfulness of certain human acts becomes acutely apparent, and drastic action, which the timidity of legislators and even of educational reformers holds back in times of peace, becomes immediately possible, and overpowers even age-old prejudice and self-indulgence, as we have seen exemplified in the war measures of European nations. Important and drastic regulation of the liquor traffic will undoubtedly take place before this book is in print. Already the bill prohibiting the sale of liquor in any army encampment or to soldiers in uniform has become a law. If national prohibition or taxation equivalent to

national prohibition becomes operative during the period of the war, there will be a reversal of the alcoholic tradition. Probably alcohol has been in use by some portion of the human race for 30,000 years. Possibly for 15,000 years chronic drunkenness has existed; in other words, since the manufacture of pottery, and the formation of utensils in which the alcohol could be stored, chronic indulgence has been possible.

Alcohol has had all the tactical advantages of possession which are popularly supposed to be equivalent to nine-tenths of the law. Efforts at regulation or reform have been in the nature of siege operations, always at least on the offensive, with alcohol either "dug in" in an interminable and intercommunicating line of trenches or in such impregnable fortresses of human indulgence and prejudice that no siege-gun of

science has been heavy enough to dislodge it. With alcohol thrown outside the breastworks for the balance of the war these conditions will be reversed. Before the gates will be opened again to alcohol it must prove its case. It has been found guilty of injuring the human race, of depriving humanity of its rightful food, of inducing crime and of injuring the ability of a nation to maintain itself in a state of war. Before alcohol can be again admitted, it must prove its compatability with national health and prosperity and with the ability of a nation to maintain itself in times of peace; it must show that it contributes more to human happiness than it takes away.

When the time of reckoning comes, as come it will, each citizen must put the question to himself, "Shall I drink, shall my sons and daughters have the

opportunity to drink?" Each citizen must then consider his answer with regard to the following: His responsibility to his country, his responsibility to himself, his responsibility to his children. Assuming that some men will not allow their sense of responsibility to their country or to themselves in the matter of health, efficiency and longevity to restrain them from drinking, it seems incredible that any man claiming the right to live in a civilized community will ignore his responsibility to his children, and deliberately jeopardize their physical and mental welfare by self-indulgence in alcohol. A man might thus act in yielding to some terrible pathological craving, but to such we are not speaking. Such men must be handled with the consideration due to the mentally unfit. It is the risk taken by the ordinary so-called moderate drinker and

his occasional excesses that we have to consider.

The evidence relating to the effect of alcohol on the offspring of drinking parents is becoming more definite and more conclusively unfavorable to alcohol. Dr. J. W. Ballantyne in a recent review of this question shows that the balance of evidence confirms the experiments of Stockard and Popanaculaoci, Bertholet and Mjöen as to the injurious effect of alcohol on the offspring of mammals, thus establishing the biologic fact that the germ plasm of an alcoholic parent can be adversely affected, contrary to the dogma of those who hold without anything approaching conclusive evidence that the germ plasm is practically inviolate and cannot be influenced by acquired characteristics or toxic indulgences of the parent. With such evidence available the honest

and conscientious parent or prospective parent will ask proof positive that alcohol cannot injure the germ plasm and the unborn child, rather than accept the conclusions of Karl Pearson and his school based upon a statistical study of limited groups and an interpretation of data that is by no means free from statistical fallacies. For example, the superior condition of the children of drinking parents found in Pearson's investigation may well be due to an elimination of the unfit children of the drinker and survival of the fit. Furthermore, such evidence could only be held as conclusive if homogeneous groups are compared. That is, the offspring of drinking parents and of non-drinking parents who are exactly of the same physical type and closely similar in all other respects, as to occupation, environment, etc., should be compared, if the

influence of alcohol is to be accurately determined by the statistical method. In the absence of such evidence, we must accept the implications flowing from laboratory experiments and from the fact that alcohol has been definitely shown to poison the individual. There is no proof that the germ plasm can completely resist this protoplasmic poison which actually reaches it during alcoholic indulgence. As stated in the text, the child is entitled to the benefit of the doubt, if any exists. The time has passed when alcohol, simply because of its entrenchment in social custom, should receive the benefit of the doubt on every count.

FOOD COST OF ALCOHOL

With regard to the amount of food that would be saved by stopping the manufacture of alcohol there is great

confusion of data, and many reckless statements have been made on the subject. It was widely published that 600,000,000 bushels of grain alone would be saved annually. Exact figures are not obtainable, but it is conservatively estimated that probably 110,000,000 bushels of grain are utilized in the manufacture of alcoholic beverages. Grapes and molasses (152 million gallons) must not be forgotten in considering these matters. Grapes utilized for sweet wines when converted into raisins constitute a most valuable preserved food, and this wine-growing industry might well be transformed into a food-growing industry.

The Brewers Board of Trade published the advertisement reproduced in the following pages, in the New York evening papers, May 4th, 1917.

BEER AND GRAIN CONSUMPTION

BEER contains about

92 per cent. water and about
5 per cent. of extract derived from hops and cereals, principally barley-malt, and only about
3 to 4 per cent. alcohol.

All of the malt and much of the barley that America is now exporting is used by our allies for beer.

None of the European countries even after two and one-half years of war has stopped the brewing of beer.

The British Liquor Control Commission has not attempted to deprive the people of their beer.

Aside from its use for brewing barley is seldom used for human food—but principally for feeding cattle.

Sorensen, the Great Danish Authority on Pure Food, States That
There Is No Waste of Cereals in Brewing Beer

He has recently demonstrated that when barley is fed to cattle for producing beef, only 51 per cent. of the food value is retained—on the other hand, when con-

verted into beer 61 per cent. of the food value of barley is retained in the most easily digested form.

The ignorant or wilful statement as to the amount of grain used for alcoholic beverages is enormously exaggerated. The facts regarding the quantity consumed for that purpose are so readily obtainable from the United States Internal Revenue Department that the failure to produce them points to a deliberate suppression of the truth.

This is what the brewers of the United States used last year (Government figures):

	Bushels.
Wheat.....	None
Oats.....	None
Rye.....	None
Barley.....	52,439,973
Corn Products.....	15,711,515
Rice.....	2,354,000
Total.....	70,505,488

35% of the material for dairy food is returned to the farmer as a better milk-producing food than in its original state..... 24,676,920

This leaves..... 45,828,568
bushels actually consumed in beer—BEING LESS than $\frac{3}{4}$ of
ONE PER CENT. of the grain production of our country.

Brewers Board of Trade of New York

It is fair to assume that this advertisement presents the full weight of evidence that the brewing interests have to offer. In replying to this presentment, it may be stated that the mere opinion of any authority, however great, is not to be accepted as against facts, and the advertisement specifically states the facts that refute their own expert's opinion. If three-fourths per cent. of the grain production is used in making beer, there must be shown a food value to this beer equal to the grain that is destroyed in making it. The weight of scientific evidence shows that beer is not a true food. Beer is practically always taken for its alcoholic effect, and if that effect is secured, as science has demonstrated is usually the case when ordinary beverage quantities are taken, the effect on the heart and nervous system is that of a narcotic drug. A drugged food cannot

be consistently compared as to calorific value with a pure food like bread or cereals.

It is true that barley is not much used for food, but it is a pure food and could be so used. It is used for bread and cereal in Russia, and is held by British food authorities to be the most palatable addition to wheat for bread making.

It is not true that the Central Board of Liquor Control of Great Britain has not deprived the people of their beer. There has been a very positive restriction in the production and a control of the production of beer, as is later shown in this chapter. Quite recently the use of barley and corn for manufacture of beer and spirits has been prohibited. The absurd figures regarding the amount of grain consumed in making alcohol have already been referred to, and the scientific experts, advocating the control

of the liquor traffic, were the first to call attention to this exaggeration and present the correct figures to the public and to the Council of National Defense.

The reports from England and France indicate grave dissatisfaction with the food waste incident to the manufacture of alcoholic beverages and with the effect of alcohol on the people in spite of the improved conditions resulting from the partial control, and further restrictive measures may be looked for. As this goes to press, an announcement is made in dispatches from England that Great Britain is about to take over the alcohol industry and that war-time total prohibition seems likely. As the further use of barley and corn for making alcoholic beverages has been forbidden, manufacturers are now restricted to the use of existing stocks.

It has been estimated that enough

grain is used in this country in the manufacture of alcoholic beverages to supply 11,000,000 loaves of bread daily.

In addition to the grain used in the manufacture of beer, as at least approximately stated in the proclamation of the Brewers Board of Trade, quoted above, there should be considered the 39,000,000 bushels of corn, rye and malt used in distilling spirits, one-half of which was used for industrial purposes in 1916. Also there must be considered the labor of those engaged in the brewing and distilling business as well as in the liquor-selling business. The loss to the country involved in depriving real wealth-producing industries of the labor of these men and the destruction of coal, gasoline, steel, wood and other material that is used in the alcohol industries, must also be figured in the bill against alcohol—the purely

economic bill. The social bill against alcohol is beyond computation. No one can even approximate the total injury to the human race from this drug, and it is better not to attempt to do so. We can state, however, quite accurately, the mortality bill against alcohol among those employed in its manufacture and this is shown in the text. (See pp. 32 and 33.)

The plea, therefore, that grave industrial and economic injury would result from prohibiting the manufacture and sale of alcoholic beverages naïvely ignores the real effect of such a measure, the diverting into healthful occupations of those now engaged in unhealthful occupations that involve the destruction of food and the manufacture of a poison instead of the production of wealth.

The statement of the Brewers Board

of Trade created the initial impression that the talk about the possible food salvage from the prohibition of alcohol is a "tempest in a tea-pot," and that the saving would be negligible—only three-quarters of one per cent. as regards beer. Assuming that the total saving from prohibition would equal 1 per cent. of the grain production, and that this is equivalent to 11,000,000 one-pound loaves of bread daily, we find that this represents sufficient available energy—approximately 13,000,000,000 calories, as well as a fairly complete ration in other respects—to maintain the 1,000,000 men contemplated for the United States army more than three years. Deducting 35 per cent., as claimed by the brewers, for salvage in brewers' offals for feeding cattle, and there still remains a huge saving in grain. Is this negligible? The only question that our organizers

of defense should ask is this: "Will the withdrawal of alcohol injure the average citizen?" If not, it *MUST* be withdrawn and this food saved to a nation that is fighting the battles of liberty and struggling to maintain the highest ideals of the race.

The loss of revenue will be more than offset by the saving to the nation from the elimination of a useless expenditure, not to mention the saving in health and the prevention of crime.

Since we can answer that the withdrawal of alcohol cannot possibly injure the average citizen, but on the contrary will contribute to his health and well-being and efficiency, and protect him from disease, especially the most horrible form of disease that follows in the wake of armies,—the venereal infection,—the argument for war-time prohibition is tremendously reinforced.

A BRITISH ANALYSIS

Let us see how our allies across the water struggled with this problem and let us profit by their mistakes. The dangers of increasing alcoholic indulgence during war times are well set forth in an article by George B. Wilson, appearing in the *London Times*, March 11th, 1916:

I have to record that, during the year 1915, the total consumption of intoxicating liquors in the United Kingdom, measured in terms of pure alcohol, has been maintained at 92 per cent. of the quantity consumed in 1914, and 90 per cent. of the figure for 1913, while the actual expenditure of the nation in 1915 on intoxicating liquors shows an increase of $10\frac{1}{2}$ per cent. over the figures for 1914, and 9 per cent. over those of 1913. It might have been anticipated

that the gravity of the national crisis, the example of His Majesty the King, the appeals from the Churches, the absence of many hundreds of thousands of men from the kingdom, and the increasing restrictions upon drinking facilities, would have led to a very marked reduction in the consumption of intoxicants. On the other hand, the extraordinarily high rate of wages, the large numbers of unsteady casual laborers who are earning double or treble their ordinary pay, the abnormal development of the practice of "treating," and the unprecedented disturbance of normal family life, caused by the enlistment of our vast army and by the present conditions of labor, which has resulted in a marked and deplorable increase in drinking amongst women, have all been factors making very strongly for an increased consumption of drink. It is, as yet, too early to measure the general effect upon consumption of the restrictions imposed by the Liquor Traffic Central Control Board since July last. Certain densely populated areas have only recently been placed under

restrictions; the provisions regulating "off-sale" of beer and spirits certainly require to be greatly strengthened; and seasonal changes always affect consumption. There are, however, indications that the decline in beer consumption during the last quarter of the year was larger than the usual seasonal decline; and the fact that the quantities of spirits taken out of bond during the second half of 1915 show a decline of 15 per cent. against the first half, instead of the usual autumnal advance, may be significant, although the fact that the very heavy forestalments in the earlier half of the year diminished clearances (without necessarily affecting consumption) in the later half of the year prevents any definite conclusion on the matter. It may, however, be safely asserted that, but for these and, to a lesser extent, the earlier restrictions, the nation would have had to face an expenditure on and a consumption of drink during 1915 which would have been of unprecedented and startling magnitude. I estimate the amount expended on alcoholic liquors in

1915 at £181,959,000, as compared with £164,463,000 in 1914, being an increase of £17,496,000. The following table shows the changes which have taken place:

1915 AS COMPARED WITH 1914.

	Expenditure (£)	Consumption
British spirits..	+3,838,000	+2,437,000 proof gallons
Foreign	+1,401,000	+889,000 " "
Beer	+12,667,000	-4,781,000 bulk barrels
Wine	+410,000	-460,000 gallons

The rise in foreign spirits is entirely due to the enormous increase (929,000 proof gallons) in the domestic consumption of rum, which would appear to have received a new lease of life at home in consequence of its use by the military authorities abroad. Wine continues the decline which has been steadily proceeding since the war began. The rise in expenditure on beer, notwithstanding the decline in consumption, is, of course, due to the increased price. The following table shows the clearances of spirits (thousands of proof gallons) during the past three years in the three kingdoms and in the United Kingdom:

		1913		1914		1915	
		Jan. to June	July to Dec.	Jan. to June	July to Dec.	Jan. to June	July to Dec.
England and	Wales	10,061	11,944	10,680	11,340	13,258	11,640
Scotland		3,060	3,650	3,193	3,284	3,686	3,001
Ireland		1,446	1,684	1,481	1,715	1,929	1,506
United Kingdom		14,567	17,278	15,354	16,339	18,873	16,147

The following table gives the details of consumption and expenditure in 1915. The figures do not include intoxicating liquors supplied to our Army and Navy outside the United Kingdom, but they do include the intoxicants supplied to the Forces within the kingdom, either by the Government or in the military canteens:

UNITED KINGDOM (POPULATION 46,089,000).

Liquors	Quantities consumed in 1914	Quantities consumed in 1915	Cost in 1915 £
British spirits, 31s. 6d. per proof gallon....	25,941,000	28,378,000	44,695,000
Other spirits, ditto...	5,753,000	6,642,000	10,461,000
Total spirits.....	31,694,000	35,020,000	55,156,000
Beer, 75s. per bulk bbl.	35,741,000	30,960,000	116,100,000
Wine, 18s. per gallon.	10,686,000	10,226,000	9,203,000
British wines, cider, etc., estimated at 2s. per gallon	15,000,000	15,000,000	1,500,000
			£181,959,000

The average expenditure per head was £3 18s. 11d., and, per family of five persons, £19 14s. 7d., as compared with £3 10s. 10d. and £17 14s. 2d. respectively in 1914. The per capita consumption of spirits was .76 proof gallon, beer 24.18 bulk gallons, and wine .22 gallon, as compared with .68, 27.6, and .23 gallons respectively in 1914. The total consumption of pure alcohol was $78\frac{3}{4}$ million gallons, as against 85 million gallons in 1914, and of this quantity $72\frac{1}{2}$ per cent. was taken in the form of beer, $25\frac{1}{2}$ per cent. as spirits, and 2 per cent. as wine. The estimated expenditure given in the table, of course, includes the taxation collected by the trade from the consumers in respect to the spirit, beer, and wine duties, which were approximately as follows:

Spirits	£25,800,000
Beer	33,500,000
Wine	1,000,000
	<hr/>
	£60,300,000

The additional duty on the beer consumed in 1915 amounted to £22,210,000. If the 30,960,000 bulk barrels consumed in 1915 had been sold at the pre-war price of 57s. per bulk barrel, they would have realized £88,236,000; at the increased price they realized £116,100,000—the higher price yielding £27,864,000; so that the public paid to the trade £5,654,000 over and above the amount which the trade collected for the State—a substantial allowance towards loss of profit on decline in consumption, higher cost of production, and expenses of financing the duty. The following table shows the consumption of and expenditure on alcoholic liquors from the outbreak of the war to December 31st, 1915:

	Quantities	Cost (£)
Spirits (proof gallons)	49,113,000	77,353,000
Beer (bulk barrels)	45,247,000	158,647,000
Wine (gallons)	13,983,000	12,585,000
British wines (gallons).....	21,250,000	2,125,000
		<hr/> £250,710,000

Of this amount about £78,000,000 went in taxation. Notwithstanding the large

amount received by the State in respect of liquor taxes since the war, it must not be assumed that any true financial gain has accrued to the State thereby—even when we leave out of consideration the social and moral consequences of our national expenditure on drink. Against the revenue so derived must be set off (1) The waste of foodstuffs used in brewing and distilling, which in 1915 were approximately as follows:

	Brewing	Distilling
Malt (bushels)	43,670,000	7,824,000
Unmalted grain (bushels).....	79,000	9,700,000
Rice and maize (cwts).....	1,217,000	13,500
Sugar and equivalents (cwts)..<	2,644,000	996,000
Hops (lbs.)	51,500,000	

The weight of the original barley and other materials thus destroyed was no less than 1,800,000 tons, to which must be added at least 1,600,000 tons of coal used in the various processes. The value of these materials, including coal, may safely be estimated at not less than £25,000,000. "Much of the primary materials used in

brewing," says the Brewers' Journal for January last, "is sea-borne"; and the Census of Production, in 1907, showed that 73 per cent. of the grain used by distillers turning out 89 per cent. of the spirits distilled was of foreign origin. Allowance must, however, be made in these calculations for the residual products, such as brewers' grains, yeast, carbon dioxide, etc., which were returned by the trade in 1907, on a larger output, at under 10 per cent. of the value of the materials. During the past year, also, the demand for spirits for military as well as industrial purposes has probably absorbed more than half of the 47,990,000 proof gallons distilled, and during the present year practically the whole output will be devoted to non-potable purposes. The quantity of spirits in bond on December 31, 1915, was, however, considerable; namely, of home spirits, 141,753,000 proof gallons—or subject to the Immature Spirits (Restriction) Act, 1915—five years' supply and of foreign spirits, 12,844,000 gallons, or nearly two years' supply. (2) The area

of land in the United Kingdom under barley in 1914 for brewing and distilling is estimated by the Board of Agriculture at 871,000 acres, or approximately the area of Shropshire. The trade would probably put the area at a higher figure. 34,744 acres are under hops, and 80,300 acres are devoted to apples and pears for cider and perry. The same estimate gives the number of men employed in these areas at 33,800. To these must be added from 5,500 to 6,000 miners engaged in getting out coal, and about 465,000 persons employed by the licensed trade in the United Kingdom, of whom in England and Wales, in 1911, at least 191,000 were men under 45 years of age, and 68,000 were women under 35 years—a large supply of labor still available even after liberal allowance has been made for enlistments, and for catering and hotel business not necessarily associated with the sale of intoxicants. To these must be added the labor involved in handling the raw materials and the finished products in their transport to and from the

breweries and distilleries by sea, road and rail. The weight of beer consumed in 1915 was considerably over 5,000,000 tons, apart from the heavy casks. "Taken in the aggregate," says Sir Alfred Booth, "the services absorbed by this trade are on a gigantic scale, and the net result of it all is a decrease in national efficiency"—a lesson which we have been learning by bitter experience during the war. Russia, without vodka, has increased her industrial efficiency, according to M. Barc, by at least 30 per cent.; an increase of only 10 per cent. in efficiency among our own workers would be worth at least as much to the Government as the present revenue from drink, which, after all, is not a fortnight's cost of the war. (3) Nor can it be economically sound to raise a tax of £60,000,000 by diverting a further sum of £122,000,000 to a generally useless and often dangerous expenditure. During the fifteen years, 1900-1914, the people of this country spent £2,516,000,000 on drink. It is startling, therefore, to find that during the same period they

only increased their deposits in savings banks (Post Office and Trustee) by £57,470,000; their shares and deposits (1899-1913) in Building Societies and Industrial Provident Societies by £44,497,000, and the ordinary and industrial life and annuity funds of their Life Assurance Companies by £198,087,000, or £300,054,000 in all. Russia, on the other hand, has even in war time increased her savings bank deposits by £55,000,000 in 1915; but, then, she at the same time has reduced her spirit revenue from nearly £70,000,000 to £900,000!

(4) The financial burden of dealing with industrial sickness under the National Insurance Act, of maintaining our great police army, our lunacy establishments, and our prisons and workhouses would be largely reduced if the national drink bill were greatly cut down, and the infant mortality rate would also show an enormous decline. If the Government is in earnest in its advocacy of thrift, let it forthwith deal with this traffic as the King has dealt with it, and, while thus preventing an enormous amount

of waste, it will at the same time promote—as in no other way—the efficiency of its workers and the general well-being of the nation.

ATTITUDE OF BRITISH LEADERS

The attitude of Britain's strong men on the alcohol question was never in doubt as may be judged by posters widely used in 1915, which are reproduced on the following pages.

But the task of sobering up the British nation was not easy, and there were strongly entrenched special interests and much national apathy and self-indulgence, as well as deep-rooted prejudice, to deal with before substantial progress could be shown in drink control. All of which shows the need of whole-hearted and complete action at the present time instead of an apologetic and timid treatment of this national peril.

Later results in Great Britain are shown in the following analysis:

The Central Liquor Control Board's

statement of the results of its operations, made public Jan. 11, shows that in twenty of the largest towns in Great Britain, where the weekly average convictions for drunkenness totalled 2,415, the number had been reduced to 1,372, or about 43 per cent. In the English towns there had been a decrease of more than 46 per cent. in the weekly average of drunkenness convictions, but of only 43 per cent. among women taken separately. Beer and spirits retained for home consumption in the United Kingdom for eight months of the financial year are 18,000,000 barrels of beer, against nearly 21,000,000 in the corresponding period in 1915, while spirits have decreased from 21,000,000 gallons to 14,000,000. Suicides and cases of delirium tremens are also less frequent since the board's restrictions of the liquor trade began. The board now controlled

170 licensed houses; 27 of these were selling no alcohol and 60 others would soon do likewise. Five hundred and fourteen canteens were at work under supervision of the board providing meals and refreshment for 1,900,000 munition workers. In addition there were 60 canteens supplying transport workers at docks. More than 200 were being provided from current profits of controlled establishments, and the total allowance made from current profits was well over \$2,600,000.

It was announced, March 30, that under an order issued by Lord Devonport, the Food Controller, the annual output of beer in the United Kingdom was limited to 10,000,000 barrels, as compared with 26,000,000 barrels allowed for the year ended March 31, 1916. At the same time, the supply of wines and spirits that might be taken

EIGHT POSTER-APPEALS
TO THE PATRIOTIC TO ABSTAIN
FROM ALCOHOL

**LORD
KITCHENER**



Secretary of State
for War, says:

"YOUR DUTY TO YOUR COUNTRY
CAN ONLY BE ACHIEVED BY
HARD WORK AND

STRICT SOBRIETY"

Whatever you want to do,
Keep Fit and you'll do it.

DRINKERS ARE NEVER REALLY "FIT."



FOLLOW THE KING

LORD KITCHENER, G.C.B.,

GENERAL SIR JOHN FRENCH,
G.C.B.

GENERAL SIR IAN HAMILTON, G.C.B.,

ADMIRAL SIR JOHN R. JELlicoe, K.C.B.,

**ALL FOLLOW THE KING'S LEAD AND
ABSTAIN FROM INTOXICATING DRINK
WON'T YOU?**

ADMIRAL LORD CHARLES BERESFORD says:

"I do not believe that alcohol in any form ever has,
or ever will, do anyone any good."

ADMIRAL
**SIR JOHN
JELlicoe**



SAYS:

"In the Navy there
are Three Qualities upon
which Efficiency mainly depends:

**DISCIPLINE, ENDURANCE,
STRAIGHT SHOOTING."**

ABSTINENCE

is necessary for the **HIGHEST EFFICIENCY.**

STRONG DRINK MAKES WEAK MEN.

DON'T DRINK!



**SIR JOHN
FRENCH**

Commander-in-Chief
of the
Expeditionary Forces,
says

"ABSTINENCE


and Self Control, make a Man more

SERVICEABLE"

Sir FREDERICK TREVES (Surgeon to the King)

SAYS

**"If you want to be Efficient,
DON'T TOUCH ALCOHOL"**



BUY
A
WAR
BOND
WITH
3^{1d.}₂ **BEER**
MONEY
A DAY
spent on liquor
amounts to
£5 6s. 5^{1d.}
Per Year.
PUT THAT INTO THE
NEW WAR
LOAN
IT WILL HELP TO
Save the Nation

FOR YOUR COUNTRY'S SAKE
and your own

DON'T DRINK

ALCOHOL

SIR ARTHUR CONAN DOYLE, M.D.

YOU will be

HAPPIER

WITHOUT IT!

HEALTHIER

WITHOUT IT!

RICHER

WITHOUT IT!

BE PREPARED!

Save Your Health,
Save Your Money,
and Keep Fit.



THRIFT will **SAVE** the **NATION**
WASTE is a **NATIONAL DANGER**

THE
STATE
APPEALS
TO **ALL**

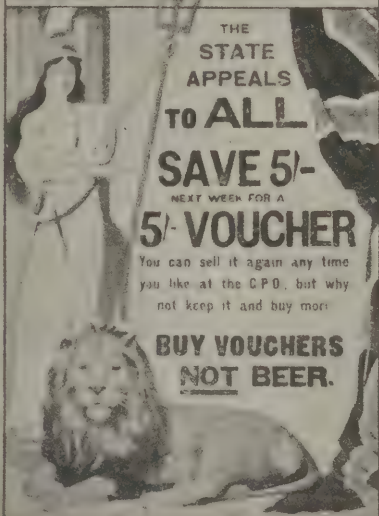
SAVE 5/-

NEXT WEEK FOR A

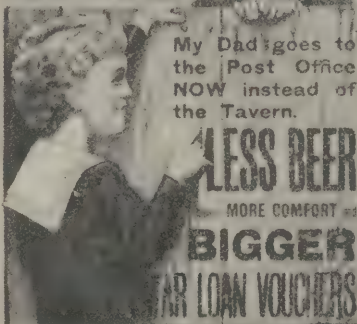
5/- VOUCHER

You can sell it again any time
you like at the C.P.O. but why
not keep it and buy more

BUY VOUCHERS
NOT BEER.



SAVE the CHILD
AND
SAVE the NATION



My Dad goes to
the Post Office
NOW instead of
the Tavern.

LESS BEER
MORE COMFORT
BIGGER
WAR LOAN VOUCHERS

Alcohol is a Poison.
You cannot be FIT if you take it.

SIR FREDERICK TREVES Surgeon to H.M. THE KING

out of bond was reduced by 50 per cent. of the amount taken out in 1916.

Pending purchase of the liquor industry by government has already been referred to and the existing prohibition of the use of barley and corn in making alcoholic beverages.

RUSSIAN AND FRENCH EXPERIENCES

A. RUSSIA

Russia, after experiencing remarkable benefits from the prohibition of vodka and practically total prohibition in many localities, sanctioned by action of the Duma, in July, 1916, the manufacture and sale of alcoholic beverages containing 14% or less of alcohol, which would include beer and the unfortified wines. Recently the Provisional Government is reported to have made 3.7% the limit of alcoholic strength, showing a reaction toward total prohibition. The Russians are popularly supposed to have been among the heaviest drinkers of the world, but available figures would indicate that the per capita consumption of alcohol in Russia was far below that

of other leading nations, and that their chief indulgence was vodka, a peculiarly deleterious drink, the consumption of which was not as widespread as many supposed, but its destructive effect practically confined to certain industrial classes and districts. The prohibition of vodka therefore was the most effective measure for the reduction of alcoholic addiction that could have been devised and comparison should not be made with countries like the United States where the per capita consumption of beer is far in excess of that of Russia. The beer consumption in Russia is negligible compared to the beer consumption of the United States and England and Germany, hence the result of the permission to use beer in Russia is no criterion of what would follow from similar regulations in this country.

A twenty-fold increase in the rate of

increase of bank deposits, and a very positive increase in industrial efficiency as reported by responsible ministers, and the unanimous and unqualified endorsement of total alcoholic prohibition by the Pirogoff Society, the leading medical society of Russia, is evidence that should be heeded by this country which now has the opportunity to profit by the mistakes and achievements of other nations, as it proceeds in the work of defense.

The following extract from a resolution passed by the Pirogoff Medical Society is of interest at this juncture when beer is being urged as a wholesome hygienic drink and even as a food. "The extension of the use of wine and beer cannot be a remedy against alcoholism because they lead to alcoholism (the well known beer alcoholism of Western Europe). Beer and wine are, on the con-

trary, dangerous because being weaker and more pleasant to the taste they attract women and children."

Robert E. Blake has given us this first-hand description of the lifting of the vodka curse from a Russian village: "One illustration from the writer's personal experience will show the far-reaching consequences of the measure. In one miserable village in northeastern Russia the income from the vodka-shop had been 23,000 rubles (\$12,160) a year. There were twenty-three 'courts' in the hamlet, which made the average outlay per group of families (married sons live with their parents) something over a thousand rubles a year. Granting that the exigencies of war-time have increased the disbursements of the family to a very considerable degree both in living and in working expenses, yet one can easily understand why the bank-

deposits of the small investors have increased at the staggering rate of five million rubles a month."

B. FRANCE

In France the failure of half measures adequately to solve the alcohol burden during the war is well set forth in the comments of the correspondent of the American Medical Association, writing from Paris under date of February 15th, 1917:

"In spite of the prohibitive measures taken since the beginning of the war, alcohol continues to make its ravages. The authorities are now considering the absolute prohibition of the use of alcohol, as was done in Russia. Naturally, such action has aroused much feeling among the retailers of alcoholics. The committee of commerce, industry and agriculture, at one of its recent meetings, authorized an investigation of this

matter. Members of the section on beverages, who were present at the meeting, complained against what they were pleased to term the 'persecution of business.' Besides the prohibition of the importation of alcohol and the levying of an extra tax on it, dealers are to be restricted to a stock of 100 hectoliters.

"Possibly the government will issue an edict absolutely prohibiting the use of these beverages. The liquor dealers regard this as a disaster, not only for commerce, but also for the country. There are 30,000 wholesale liquor dealers in France, and 500,000 retailers. These men, together with their employees, a not inconsiderable number, would be practically without employment, as they would be forced to close their doors. On the other hand, the retailers claim that the use of alcohol for drinking purposes has diminished 50 per cent. since the beginning of the war. The consumption has fallen from 1,800,000 to 900,000 hectoliters. A strong protest was registered at this meeting against all measures

tending to suppress the consumption of alcohol, on the ground that the laws now in existence, if properly administered, were sufficient to control the situation. The authorities, however, are of a different opinion. The Chamber of Deputies has enacted a law to repress intoxication, and to police all places in which liquors are sold. It is interesting that at the meeting referred to it was voted that alcoholism is a national peril, but that it also was one of the nation's most valuable assets. It was urged that the production of alcohol for commercial use be encouraged, but that the drinking of alcohol be restricted. Unfortunately, the dealers in alcoholics are not all in favor of this restriction. An anonymous communication presenting this point of view is being distributed widely. It appeals to the people for support to combat what is regarded as a catastrophe for France. It appeals particularly to the temperance advocates, calling their attention to the fact that the prohibition of the use of alcohol would include cognac, rum, curaçoa, black-currant ratafia,

Madeira wines, quinin and gentian tonics, etc., thus bringing inevitable ruin on France and her colonies, leading to popular uprisings, and last, but not least, the triumph of German beer.

"The commanding general of the armies has interdicted, in the zones determined by the general commander-in-chief, the circulation and sale of alcohol and spirituous liquors. To make this mandate sufficiently effective, penalties were heretofore lacking. Therefore a law has been passed sanctioning the prohibition of the sale and distribution of alcohol as decided on by the military authorities. Infractions of the law are punishable the same as in laws made by the administrative authorities. The same penalties will apply, in case of infraction, to the arrangements made to prevent the giving of alcohol and spirituous liquors to the soldiers.

"To prevent the danger of alcoholism among foreign-born natives, the military colonial workers on service or passing through the Marseilles region (Senegals,

Arabs, Kabyles, Indo-Chinese, etc.), the commanding general of that region has decided that the sale of wine, and in general of all alcoholics, even those of a test less than 23 degrees, was interdicted for men coming under these categories. A very active surveillance will be exercised over the retailers of alcoholics. In cases of infraction they will not be allowed to admit troopers and colonial workers."

ATTITUDE OF AMERICAN MEDICAL PROFESSION

At the meeting of the American Medical Association held on June 6, 1917, Dr. Charles H. Mayo, the noted surgeon, in his presidential address stated that the only legitimate use for alcohol was in the arts and sciences, and that its use in medicine had become greatly restricted because other less menacing drugs and remedial measures could be used instead. He stated that the advisability of national prohibition as a war measure was beyond discussion, and that the medical profession would welcome national prohibition. These expressions brought enthusiastic response from the assembled physicians, which left no doubt as to their sentiments.

At a later meeting the House of Dele-

gates of the American Medical Association passed the following resolution:

Whereas, We believe that the use of alcohol is detrimental to the human economy, and whereas its use in therapeutics as a tonic or stimulant or for food has no scientific value, therefore

Be it resolved, That the American Medical Association is opposed to the use of alcohol as a beverage; and

Be it further resolved, That the use of alcohol as a therapeutic agent should be further discouraged.

Entirely apart from moral grounds, the judgment of the majority of scientific men is against even the so-called moderate use of alcohol, and this judgment, long withheld through scientific conservatism, but now unequivocally and boldly stated by the distinguished surgeon who has received the highest mark of confidence that the medical profession can offer, should

be accepted by the lawgiver, business man, and patriotic citizen who wishes to best serve his country with his total and maximum efficiency of mind and body.

DESCRIPTION OF ALCOHOLIC BEVERAGES

MALT AND FERMENTED BEVERAGES

Malt liquors are usually prepared from grains. A mash is formed by grinding the grains and boiling with water to form a starch paste. To this is added barley malt, which converts the starch into dextrose. After filtration, hops and yeast are added, and when the fermentation has reached the proper point it is checked by heat. Various adulterants are added to cheap beer instead of hops to give it the characteristic bitter flavor. Quassia, gentian and wormwood have been used for this purpose.

Malt liquors, such as beer, ale, porter and stout, contain a certain amount of

CO₂ (carbonic acid gas) which gives them their "life" or effervescence. Malt liquor contains from 3 to 7 per cent. of alcohol, also dextrose, malt sugar and acids. Purins or uric acid forming compounds are present in the amount of about .145 gram per liter.

Ale, porter and stout contain more alcohol than beer. The dark color of porter and stout is due to the roasting of the malt that changes it to "caramel." The liquid extracts of malt used medicinally are simply weak beers, and have no magical virtues either as food or medicine. They contain a small percentage of alcohol and certain extracted nutrients that might better be secured from normal foods.

Wines are made by fermenting fruit juices with yeast. They contain from 8 to 15 per cent. of alcohol by volume, also other substances, such as glycerin,

organic acids, aldehydes, alcohol other than ethyl alcohol, furfurol and esters, or compounds that give the flavor or "bouquet."

Red wines are fermented with the skins from which the coloring matter is derived. Such wines as claret are quite astringent owing to the presence of tannic acid. White wines are free from skins, stems, and seeds. Sauterne and Chablis are examples of white wines. Sweet wines contain free sugar; dry wines have been fermented to the point of destroying all the sugar. Fermented apple juice and pear juice belong to the class of wines. The stronger wines, sherry, port, and Madeira, are "fortified," that is, distilled liquor, made from grapes, raisins, figs, or sweet potatoes, is added to bring the alcoholic strength from 17 to 25 per cent. Yeast fermentation ceases at about 15 per cent. strength

of alcohol, hence, unfortified wines cannot exceed 15 to 17 per cent. alcohol at the most. Sherry is an acid wine and contains practically no sugar. Port is less acid, but is fairly rich in sugar, 3 to 7 per cent.

DISTILLED LIQUORS

These are whisky, brandy, gin and rum.

Whisky (*Spiritus frumenti*) is made by distilling the mash of fermented grain (corn, wheat, barley, rye). It contains 44 to 55 per cent. of alcohol by volume.

Gin (*Spiritus Juniperi Comp.*) is prepared by distilling rye mash and redistilling with some aromatic, such as juniper berries, coriander, or cardamom. It contains 60 to 70 per cent. of alcohol.

Brandy (*Spiritus Vini Gallici*) is distilled from grape wine. It contains 46 to 55 per cent. of alcohol.

Rum is distilled from fermented molasses and contains a higher percentage of alcohol than brandy, although it varies greatly in strength.

Cordials have a high percentage of alcohol, 50 to 67 per cent., and also of cane sugar, 27 to 32 per cent.

Absinthe has the highest percentage of alcohol, 67 per cent., and has a peculiarly deleterious effect upon the brain and nervous system. Its importation into the United States has been prohibited since 1912, and its manufacture is prohibited in Belgium, Holland, France and Switzerland.

To this list of undisguised alcoholic beverages we must add a long list of disguised beverages masquerading under the guise of "cure-alls"—spring medicine, sarsaparilla tonics, "Vinol," strength builders, etc., which constitute a striking exhibition of the widespread lack of

adjustment of civilized man. Either for ache or pain or vague physical or mental discomfort, if not for manifest disease, he spends an enormous sum annually for drugs, most of the liquid form being alcoholic. According to law the alcoholic strength must now be set forth on the label. Hence no citizen can plead ignorance of the fact that the spring tonic is actually a fairly strong wine, that the cod-liver oil extract is practically an alcoholic beverage with no oil in it. No control of the liquor traffic will be adequate that does not also control this traffic in alcoholic concoctions which are not only injurious because of their alcohol, but also because of the false hope that they hold out of cure for conditions that need intelligent medical, surgical or hygienic government. The credulity of the people with regard to patent medicines is an evidence of the need for

education in the simple fundamental principles of physiology and the nature of the more prevalent acute and chronic diseases. The nonsensical claims of the quack and the medicine monger would then fall flat.

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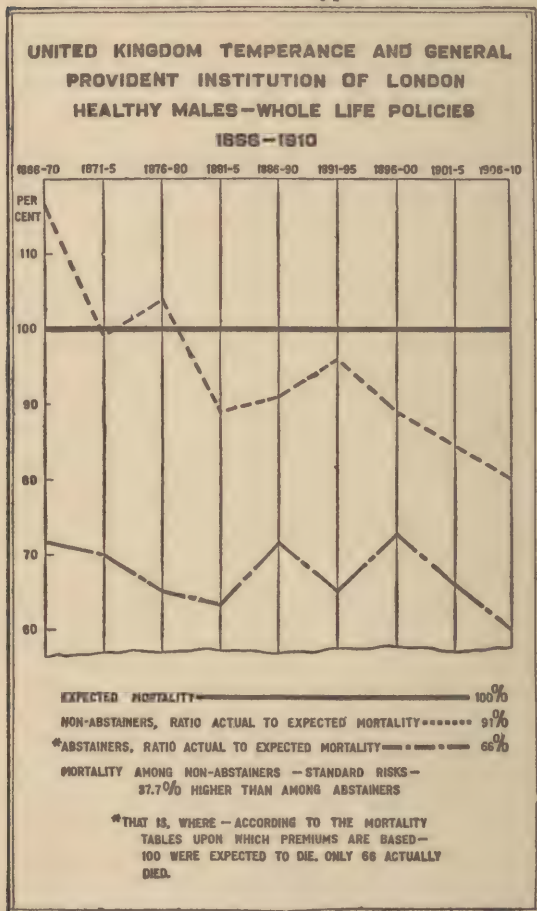
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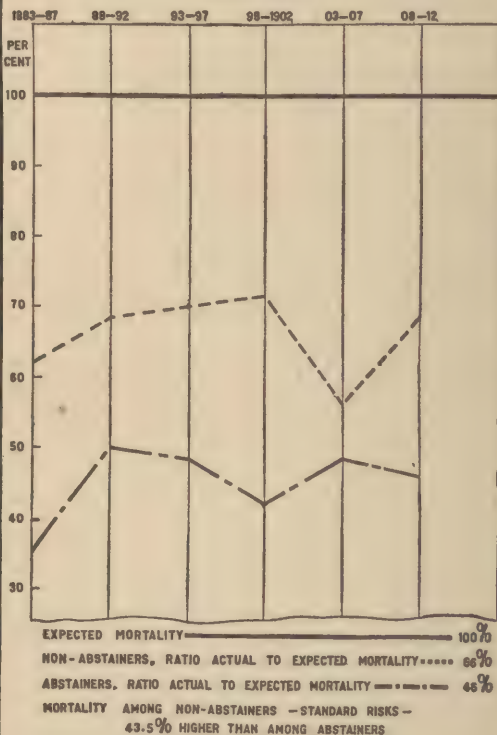
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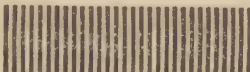
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OR 1GLASS OF WHISKEY
DAILY

118



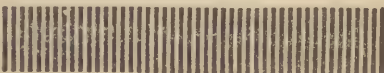
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ARENTLY CURED

150



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POLICYHOLDERS USING
MORE THAN 2GLASSES
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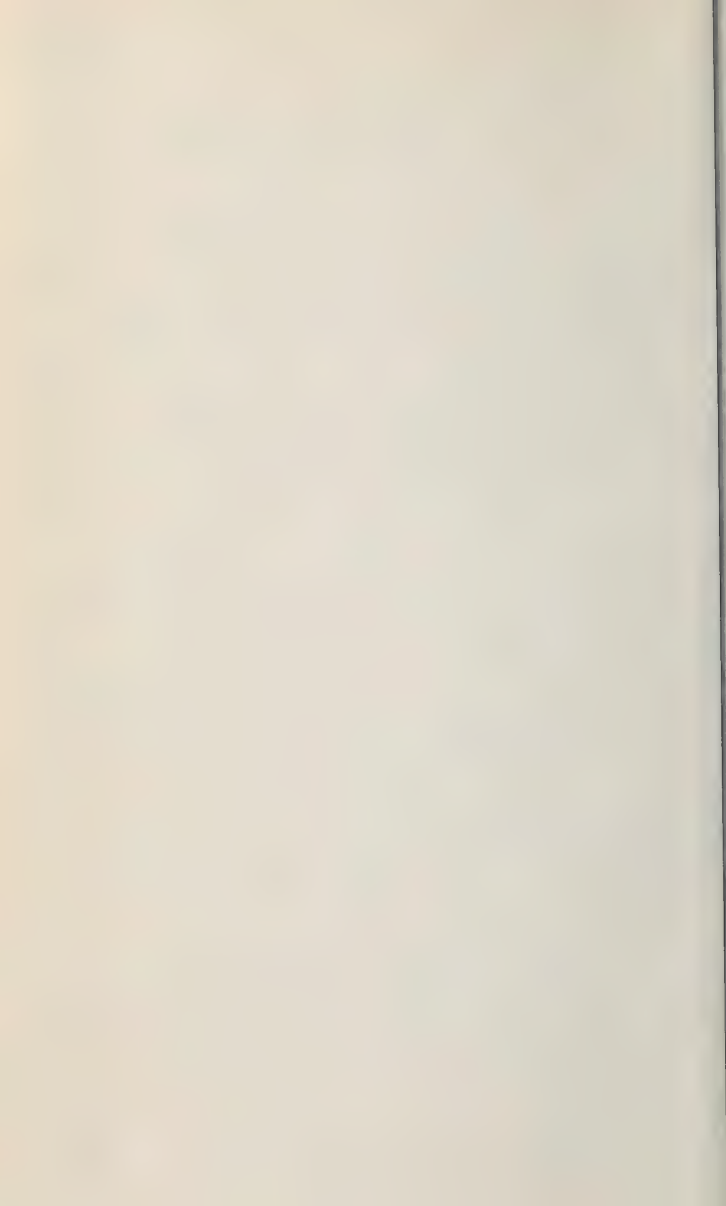
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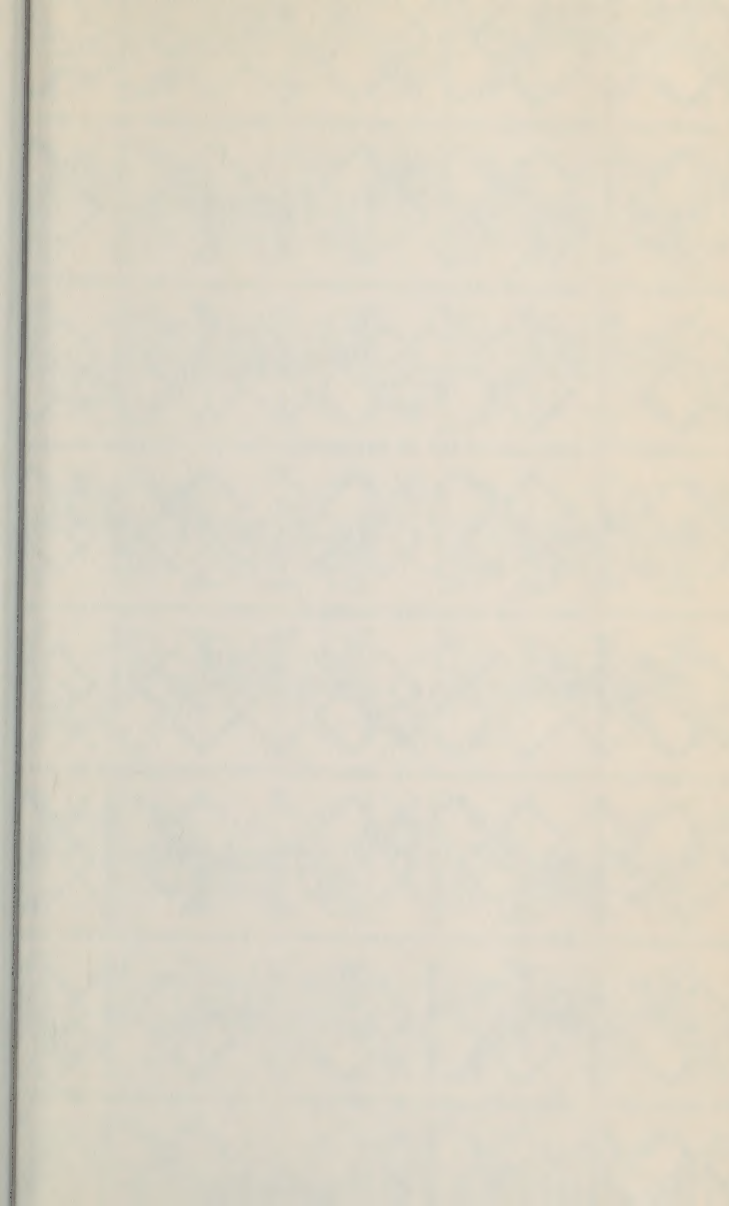
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